MAINE DEPARTMENT OF TRANSPORTATION
HIGHWAY PROGRAM
GEOTECHNICAL GROUP
AUGUSTA, MAINE

SUBSURFACE INVESTIGATION FOR RECONSTRUCTION OF ROUTE 2 GILEAD, MAINE

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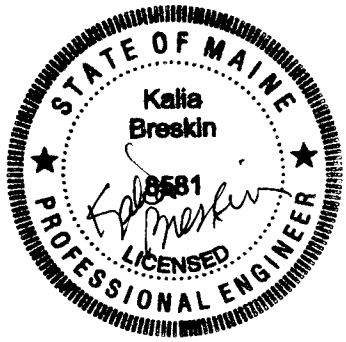

Oxford County
PIN 9184.60

Soils Report No. 2009-13

Federal NH-9184(600)E
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1.0 Introduction

1.1 Project Overview

Maine DOT proposes to rebuild the final section of Route 2 in the Town of Gilead. The project scope includes substantial horizontal and vertical realignment and full depth reconstruction. This report describes conditions from Station 3+003 0.45 km, west of the Wild River Bridge, extending 3.3 km easterly to Station 6+300, 2.9 km east of the same bridge. A separate report discusses conditions at the Wild River Bridge, to be replaced as part of this project.

1.2 Summary of Recommendations

- Where the roadway subgrade will consist of blasted rock, the subgrade should be fractured to a depth of 1.2 meters below the surface to ensure pavement structure drainage.

- The Contractor is likely to encounter groundwater seeps in cut slopes. A riprap downspout should be placed from any seep to the ditchline to allow drainage and prevent erosion of the slope.

- Existing pavement should be removed in all fill areas where the proposed subgrade elevation will be less than 1.4 meters below the existing pavement surface. This will minimize the problems of trapped water between the existing and new pavement sections.

- Large cobbles and boulders may be encountered in cuts at subgrade and in sideslopes. Cobbles and boulders should not be left projecting more than 150 mm from sideslopes or into the subbase soils.

- Contractor must exercise extreme care of slope surfaces and of the geocell facing during construction of the Reinforced Soil Slope in the area of Station 5+560. Infilled geocells should be covered with TRM before the end of each working day. No geocells should be left unstabilized for longer than a single night due to the risk of soil loss.

2.0 Site and Subsurface Conditions

2.1 General Site Conditions

The existing roadway was designed in 1927 and 1931 as State Highway "O". It was designed to have 2.74 m (9 ft) travel lanes with 0.9 m (3 ft) unbased shoulders. The surface gravel was 100 mm to 150 mm (4 to 6 inches) thick over a 125 mm to 200 mm (5 to 8 inch) base course. MaineDOT has no record of improvements since original construction, but the roadway has been widened and paved with hot mix asphalt. The paved roadway has been overlaid several times.

Land use along the project is mostly woodland with a few residences and small businesses. The White Mountain National Forest has a rest area on land south of the highway in Gilead village. Undeveloped land surrounding the highway is largely owned by paper companies. The St. Lawrence and Atlantic Railroad abuts or is near the highway on the north for much of the project. The topography is generally hilly but not mountainous, and slopes in most areas are moderately steep but not severe. There are some areas with extremely steep, marginally stable slopes. Several significant drainage swales and small streams cross under the highway.

Existing ditches are inadequate, and subsurface drainage problems add to the pavement distress along this road. The existing pavement section includes approximately 120 mm of HMA and macadam over sandy soils of varying thickness. It is in poor condition.

2.2 Mapped Data

Geologic mapping by the National Wetlands Inventory indicates there are no significant areas of wetland soils adjacent to the highway in the area covered by this project. The NWI map of this area is included in Appendix A.

NRCS mapping indicates Colton gravelly sands for most land adjacent to the highway with Adams sands west of the Wild River and Lyman-Tunbridge soils in the east. Lyman-Tunbridge soils are associated with shallow bedrock. The NRCS maps consider only the upper 1.5 meters of soil. The NRCS map and soils data for the area of this project are included in Appendix A.

The Surficial Geology Map, Gilead Quadrangle, by Maine Geologic Survey shows most of the land area surrounding the road from the beginning of the project to approximately Station 5+000 deposited as sand and gravel glacial outwash, with stream alluvium surrounding the Wild River. Till is indicated on the steeper slopes from Station 5+000 to approximately Station 6+000 and ice-contact deposits of sand and gravel from Station 6+0000 to the end of the project. A section of the Surficial Geology map is included in Appendix A.

2.3 Subsurface Investigation

The subsurface investigations for this project were started by Haley and Aldrich in 2002. Limits of the individual segments of the project have changed several times, and additional investigations have been done for this and all segments. The initial investigation included 17 borings within the limits of the current project. Probes in 14 locations and an additional 7 borings between Station 3+280 and Station 6+060 were completed in August, 2008. Log and test data from a boring at Station 6+300 is also included in this report. The final borings at Stations 5+560 and 5+620 were completed in February 2009.

2.4 Native soils

Much of the existing roadway was constructed as fill on the side of the hill, and soils under the travelway and shoulders are embankment fill similar to the native soils but less dense. Native soils are generally poorly graded sands with trace to little silt, and include areas with many cobbles and boulders. In general these soils do not meet Standard Specification 703.06 for Type D or E gravel. Table 1 Shows the boring and probe locations and describes the soils encountered.

Table 1 – Subsurface Soils

Station	Offset	Refusal	NR		Soil Type
3+171	2 LT		1.52		SAND – glaciofluvial
3+169	11 RT		1.52		SAND – glaciofluvial
3+240	CL		4.57		
3+280	7.7 LT	3.75			SAND - tr Silt
3+320	CL		4.57		SAND – Glaciofluvial
3+262	28 RT		1.52		SAND – glaciofluvial
3+257	41 RT		1.52		SAND - fill, H2O at 1.52 m
3+640	37 RT	1.68			Sandy GRAVEL - through existing roadway
3+940	2 RT		2.13		SAND – glaciofluvial
4+097	6 LT		1.52		SAND, silt, SAND - glaciofluvial
4+100	6 RT		1.52		SAND, silt - glaciofluvial
4+200	6 LT		1.52		fill, SAND - glaciofluvial
4+200	7 RT		1.52		SAND, silt, SAND - glaciofluvial
4+300	7 LT		1.52		SAND – glaciofluvial
4+300	8 RT		1.52		fill, SAND - glaciofluvial
4+580	3 LT	1.83			Sandy GRAVEL - through existing roadway
4+780	6.5 LT	0.46			
4+800	4 LT	0.58			
4+800	11 RT	0.82	8.14		Silt, 0.82 to top of rock
4+820	14 RT	1.22			
4+850	7 RT	1.07			SAND, glaciofluvial
5+049	8 LT		1.55	Cobbles	SILT – glaciofluvial
5+049	7 LT		6.71		from 1.92 - SAND - glaciofluvial
5+320	14 RT		6.13		SAND, silt, SAND - glaciofluvial, cobbles below 2.13
5+340	3.6 RT	4.18			Sandy GRAVEL - cobbles etc – SAND
5+380	12 RT		2.13		SILT, SAND - glaciofluvial
5+720	18.2 RT	1.1			
5+740	16.4 RT	1.52			
5+760	14.5 RT	1.16			
5+780	19.0 RT	1.49			
5+800	18.0 RT	1.49			
5+820	15.0 RT	1.4			
5+840	11 RT	1.04			
5+860	11 RT	2.13			
6+060	10.6 RT	1.16			
6+300	3.5 RT		2.44		SAND

Boring logs and probe data is included in Appendix C and lab test data is in Appendix D.

2.5 Existing Pavement

Pavement cores were taken at Stations 3+940, 5+340, 3+940, 6+300 and on Rte 113 at Station 0+047. These cores showed a variable pavement thickness, with macadam in some places under the Hot Mix Asphalt. Table 2 shows the HMA surface thickness encountered in cores.

Table 2 - Pavement Cores

Station	Offset (m)	Thickness
0+047		90 mm
3+940	2.0 LT	45 mm HMA on 75 mm macadam
5+340	3.6 LT	50 mm
6+300	3.5 RT	140 mm

The soil materials under the pavement surface are generally sand and gravel. They are finer than gravels allowed under Standard Specification 703.06, aggregate for base and subbase. These sands could be either embankment fill or native material; soils within the pavement structure are very similar to native soils in the area. Although soils encountered under the HMA pavement suface do not meet the Maine DOT standard specification for Type D or Type E subbase gravel, many samples meet standard criteria for well-graded sands.

2.6 Subsurface Ledge

Subsurface Ledge was encountered in many borings, and outcrops are common along this project. Some of the refusals in MaineDOT borings may be large boulders, but extensive areas of surface ledge are visible along this project, and shallow subsurface ledge is anticipated.

3.0 Design Recommendations

3.1 Pavement Design

Very little of the new highway will be on the existing horizontal and vertical alignment, and complete reconstruction of the pavement structure is needed. A single pavement structure should be used throughout the project. A Soil Support Value of 4.5 is appropriate for most of the native soils on this project, and is reasonable for use in the deep fill sections. A Resilient Modulus of 35,000 kPa should be used.

This project will include two alternates for the pavement structural section, as follows:

160 mm HMA	150 mm HMA
280 mm Type B gravel	250 mm dense graded base course
365 mm ASC-G	405 mm ASC-G

These sections produce a similar pavement structural number. Both designs meet structural requirements to support projected future traffic loadings for a 20-year design life.

Transition zones will be required where the subgrade changes to and from pockets of frost susceptible soil, with a typical 20:1 transition.

If pockets of soft or loose soils are found at subgrade, a non-woven geotextile meeting MaineDOT Standard Specification 722, Stabilization/Reinforcement geotextile may be used to help support the subbase soils and construction traffic. This geotextile should be placed as shown in Standard Detail 620.03.

Existing pavement should be removed in all fill areas where the proposed subgrade elevation will be less than 1.4 meters above the existing pavement surface. This will minimize the problems of trapped water between the existing and new pavement sections.

Fracture blasting will be required in all cuts where ledge will form the new highway subgrade to promote subsurface drainage. Fracturing should be extended to a depth of 1.4 meters below the bottom of the subbase to prevent formation of trapped water pockets. After detonation, any rock extending into the subbase should be removed, and compaction will be needed to ensure that the fractured rock material forms a stable base for the roadway.

3.2 Embankment fills

Horizontal and vertical alignment changes are required, and both embankment fills and sidehill fills will be required. We do not anticipate slope stability problems in any of these areas if the surface soils are adequately prepared and the embankments are properly constructed.

The soils used in embankment construction are anticipated to be primarily sand with moderate to low fines content, from excavation on or near this project. It may be difficult to get vegetation established on the native soils in this climate on the north side of the hills. These soils will be quite erodible, and the slopes must be stabilized during construction.

Embankment fills nearly 9 meters high will be constructed for the east approach to the Wild River Bridge with 1v:2h slopes on the Right and 1v:1.5h riprap slopes on the Left. The underlying soils will be stable with these slopes. Riprap should be installed as the construction progresses to minimize erosion of the slopes.

Fills onto the north side of the hill will be needed between Station 4+640 and Station 5+200 to shift the centerline to the Left to flatten a curve. Much of this section requires a fill on the Left and a cut on the Right. The maximum height of fill is approximately 6 meters in this area. A 1v:2h slope will be built on the Left, and underlying soils will be stable for these fills.

From Station 5+440 to Station 5+720 an embankment fill will be built on the Left side of the existing roadway in order to improve vertical and horizontal alignment. Slopes as steep as 1:1 are required for this alignment change. A Reinforced Soil Slope will be constructed from approximately Station 5+510 to Station 5+590, as discussed below in Section 3.3. Riprap should be used on all slopes steeper than 1v:2h except in the area of the reinforced soil slope where geocells will be used with a specially designed seed mixture and turf reinforcement mat.

A fill on the Left will be constructed from Station 5+840 to Station 6+080 with 1v:4h slopes, and there are no stability concerns for this section.

3.3 Reinforced Soil Slope

A geotextile reinforced soil slope (RSS) will be constructed on the north side of Route 2 between Stations 5+510 and 5+590. The road will be raised and widened in this area. Existing slopes are variably steep below the highway; as steep as 1v:1.1h on some upper and lower parts of the slope. In the new alignment the centerline will be approximately 3 meters above existing grade, to the Left of the existing centerline.

Construction of a flatter slope to raise the roadway was not feasible. Construction access to the toe of slope would have been problematic, and the resulting reduction of area in the pond at the toe of slope would have raised the water level against the railroad embankment during the spring.

Sliding failure of the RSS mass is not a concern and a shear key will not be needed below the RSS. The face will not be wrapped.

The RSS will be faced with geocells constructed according to the requirements of Special Provision 620.604. MaineDOT owns the expandable geocell material, but design and installation will be required under the Special Provision. The use of geocells for the facing of the RSS eliminates the potential slip plane that is possible with a geotextile wrapped face on a slope at this angle. Loam will be used for infill material. A special seeding mix and turf reinforcing mat will be required to promote the growth of vegetation and ensure protection of the slope surface.

Filled geocells should be covered with TRM before the end of each working day. If the contractor elects to leave any geocells unstabilized overnight, the cost of any necessary repair should be incidental to the RSS. No geocells should be left unstabilized for longer than a single night due to the risk of soil loss and the difficulty of repair.

Native soils in this hill may include cobbles and boulders although none were encountered in borings in this area. A boring at Station 5+620 encountered ledge refusal at a depth of 1.68 meters. A boring at Station 5+562 extended to refusal at a depth of 7.19 meters through moist SAND, generally very dense. Groundwater was encountered at a depth of 5.79 m.

Surface water appears to enter boulder fields above the roadway and drain underground to exit below the road in deep gullies. Groundwater seeps may be encountered during construction. Some are shown on survey plans and others are anticipated. A chimney drain will be constructed at the back of the RSS in all areas where groundwater seeps are shown on the plans, encountered or anticipated, draining out through the toe of slope. Stone meeting the requirements of Special Provision 703, Large Stone Materials should be used for riprap, and the drain should be encased in geotextile to prevent loss of void space due to infiltration of fine particles. We anticipate that this drain will extend from Station 5+520 to 5+545, 5+560 to 5+576, and 5+580 to 5+590. The final areas to be drained will be determined during construction.

The most critical failure paths for the slope extend into the lower slope, but only the upper slope will be reinforced. The reinforcement geotextile extends well back into the slope to interrupt circular failure paths that enter at the top of slope and exit through the lower slope. The reinforcement geotextile should be placed parallel to the roadway centerline in profile and horizontal in section, with the lowest layer approximately 10 meters below the centerline. The shortest reinforcement geotextile is at the bottom of

the constructed area, with a length of 7 meters. Each additional layer of reinforcement will extend to the back of a 1v:1.5h excavated slope behind this lower layer, to a maximum length of 10 meters above the existing roadway. There may be some short sections of slope where existing gullies require the fill to extend further down the slope from the highway centerline. Any added slope area will be determined during construction. The computer model and details for this slope are included in Appendix E.

Placement of geotextile for this application will require substantial excavation. Excavated soils may be reused in this slope only if the soils meet the requirements of Special Provision 620, Geotextile Reinforced Soil Slope. The maximum particle size allowed for reinforced backfill should be 100 mm to protect the geotextile.

3.4 Soil Cut Slopes

Deep cuts will be required for the construction of this project. Most are cuts into the side of the hill on the Right side of the highway to construct shoulders and ditches, but a few are cuts through the existing embankment to correct the vertical alignment. Cut slopes are generally 1v:3h or flatter, although slopes are steeper in some sections.

Rounded stones should not be used as riprap on cut slopes, due to the length of the slopes, the possibility of ice action surrounding groundwater seeps, and large amounts of spring runoff in the areas near the White Mountains. A Special Provision for large stone materials is included in the appendices to better define the materials that will be acceptable. All cut slopes must receive temporary stabilization during construction. Native soils in all areas will be predominantly SAND with varying amounts of gravel, fines, and cobbles.

The western approach to the new Wild River Bridge between Station 3+100 and Station 3+340 will require deep cuts of nearly 6 meters at the deepest section, A deep refusal was encountered at Station 3+280, but most of this cut will be in soil. Vegetated side slopes of 1v:2h will be used in this area. Sand and sandy gravel from galciofluvial deposition were encountered in borings in this area.

From Station 3+680 to Station 3+900 the new alignment will be lower than the existing roadway. This is in the developed area of Gilead village; cuts of less than 3 meters will be needed, and side slopes will be 1v:3h or less to fit within the Right of Way constraints and preserve the village character. Sand and sandy gravel were encountered in these borings.

From Station 5+240 to Station 5+400 the roadway will be lowered over the top of a small hill to correct the vertical alignment. Side slopes of 1v:2h will be built. Sand and sandy gravel with cobbles were encountered in borings in this area.

From Station 5+780 to Station 5+860, we anticipate shallow overburden over the bedrock in the area of ledge cuts above the snowmobile trail. A gabion wall is included in the design, but final design of the wall will be completed by MaineDOT during construction, when depth to bedrock at the wall location is known. This wall will be 15 meters from the centerline of Rte 2 and well above the road, and severe corrosion from salt on the gabion baskets is not anticipated.

3.5 Rock Cut Slopes

Rock cuts will be required for this project. Controlled blasting will be required for all rock slopes where the height of the cut exceeds 2.4 meters and/or the overburden will have a slope greater than 1v:3h. Ledge slopes of 4v:1h should be stable for the bedrock along this roadway.

Any section where the rock cut will be more than 2.4 meters tall will require an adequate rockfall zone. If the overburden slope is excessively steep above the rock cut, permanent slope stabilization should be added during construction.

Between Station 4+740 and 4+840, rock cuts of as much as 12 meters high will be required to move the centerline to the Right. At some sections the top of the cut is an area of surface ledge but in other sections there will be an overburden slope on top of the rock cut face. The steepness of the slope and slope treatment will be determined during construction. Tracks of the St. Lawrence and Atlantic Railroad are at the toe of slope approximately 16 meters left of the area to be blasted at Station 4+780.

From Station 5+680 to Station 5+900 rock cuts will be required on the Left side of the highway and to relocate a snowmobile trail above the road on the Right. Cuts will be as much as 8 meters high above the trail. Subgrade fracturing will not be needed under the snowmobile trail. Existing overburden slopes are 1v:2h to 1v:1h above the rock cuts. A low rock cut will also be required on the Left from Station 5+720 to 5+780, approximately 40 meters from the railroad.

3.6 Surface Water Drainage

Surface water on the right will be collected in ditches in all areas of the project except from Station 3+700 to 4+280, Right, where a curb and underdrain will be used to minimize impacts to the abutting property. Because the soils in these ditches will be highly erodible sands, the ditches must be lined with a less erodible material.

3.7 Groundwater

Groundwater seeps are difficult to detect during a subsurface investigation program. If seeps are encountered in cut slopes during construction, downspouts should be constructed as needed to carry the water to the ditch without damage to the underlying slope.

3.8 Frost Action

Mean frost depth for these soils is estimated as 1370 mm, with a design frost depth of 1700 mm. Frost penetration into granular subgrade is estimated as 865 mm, with a design frost penetration of 1400 mm.

Soils in this area are granular materials with low fines content, and are slightly frost susceptible, however pockets of soils with higher fines may be encountered during construction. Any water trapped in the upper subgrade will freeze.

Appendix A
Resource Maps
Surficial Geology
NRCS Soils Survey
National Wetlands Inventory

Gilead Quadrangle, Maine

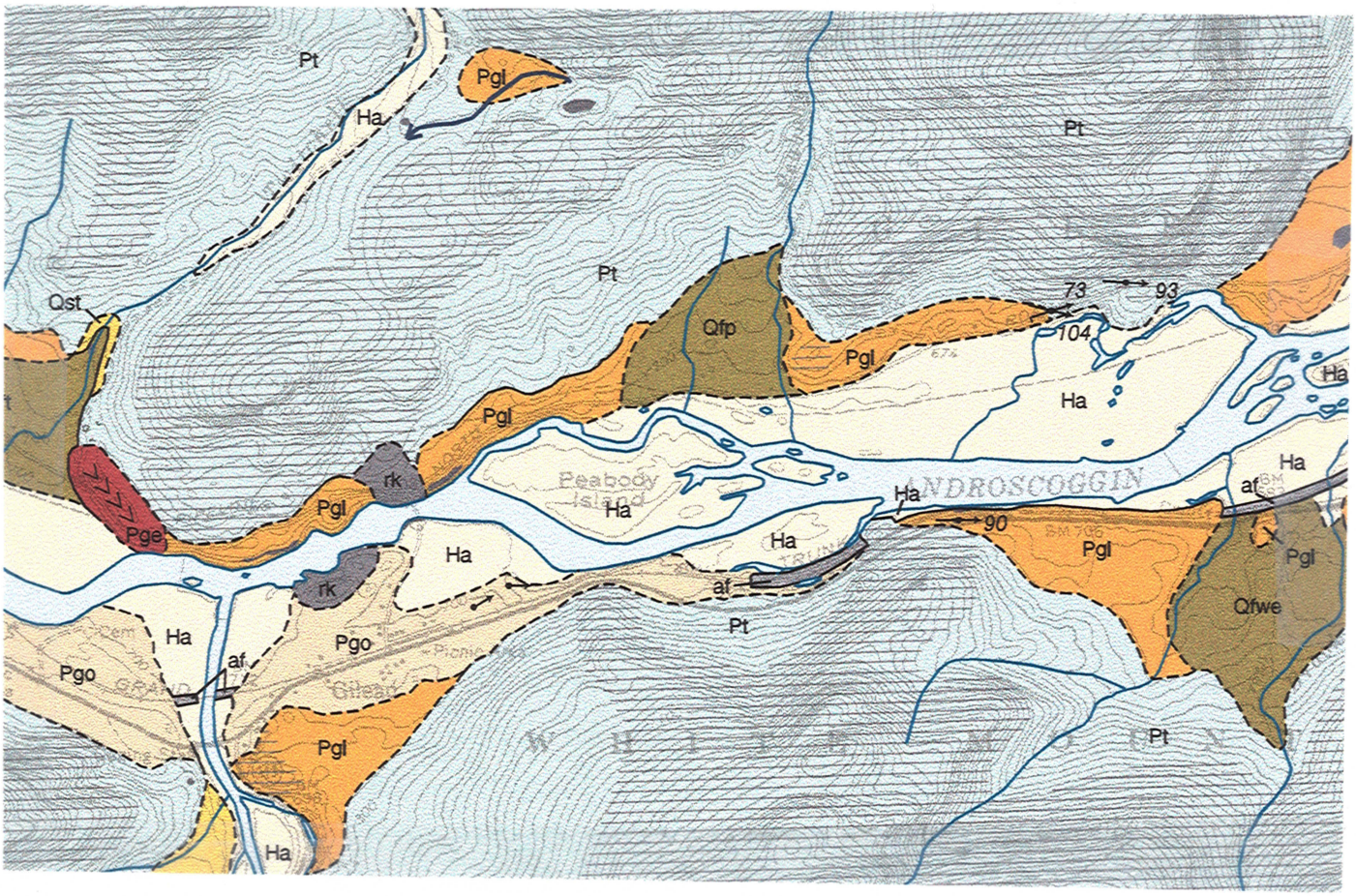
Surficial geologic mapping by
Woodrow B. Thompson

Digital cartography by:
John B. Poisson

Robert G. Marvinney
State Geologist

Cartographic design and editing by:
Robert D. Tucker

Surficial Geology

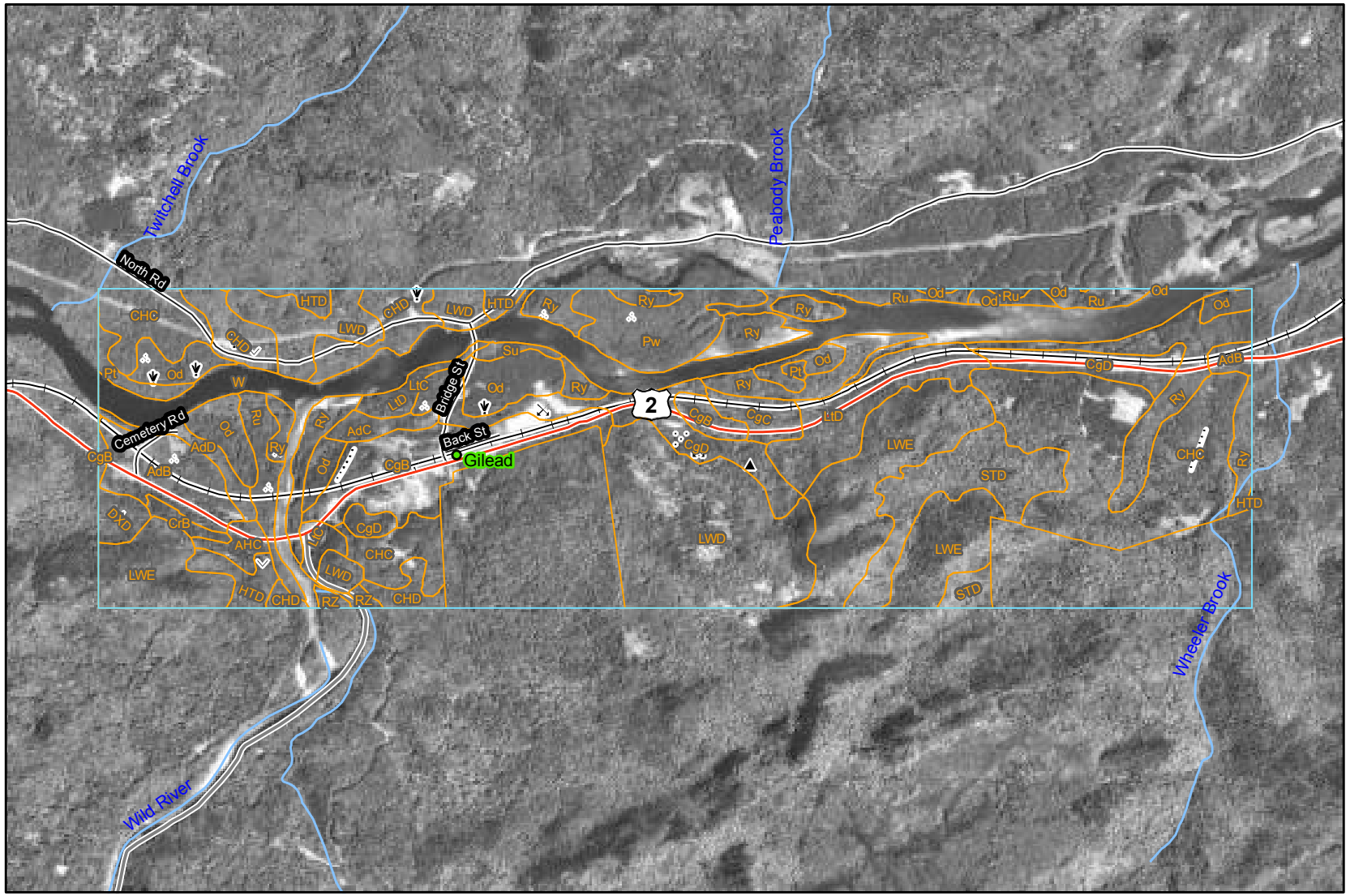


Soils near Route 2:

Ha: Stream Alluvium – Gravel and sand deposited on flood plains of modern streams.
Pgo: Outwash deposits – Sand and gravel deposited by glacial meltwater streams in the Androscoggin Valley. Many include deltaic sediments.
Pgi: Ice-contact deposits – Sand and gravel deposited in contact with remnants of glacial ice in the Androscoggin River and Twitchell Brook valleys.
Pt: Till – Loose to very compact, poorly sorted, massive to weakly stratified mixture of sand, silt and gravel-size rock debris deposited by glacial ice. Locally includes lenses of waterlaid sand and gravel.
af: Artificial fill – Earth, rock, and/or man-made fill along roads and railroads.

Soil Map—Oxford County Area, Maine, and White Mountain National Forest, Maine
(Gilead PIN 9184.60)

70° 59' 36"
70° 55' 54"
44° 24' 32"
44° 24' 36"



44° 22' 45"
44° 22' 49"
70° 59' 33"
70° 55' 50"

Map Scale: 1:23,500 if printed on A size (8.5" x 11") sheet.

N

Meters
0 300 600 1,200 1,800

Feet
0 1,000 2,000 4,000 6,000

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features
- Gully
- Short Steep Slope
- Other

Political Features
- Cities

Water Features
- Oceans
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads

MAP INFORMATION

Map Scale: 1:23,500 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:20,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 19N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Oxford County Area, Maine
Survey Area Data: Version 11, Jan 27, 2009

Soil Survey Area: White Mountain National Forest, Maine
Survey Area Data: Not available

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Date(s) aerial images were photographed: 5/15/1999; 6/9/1997

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Oxford County Area, Maine (ME613)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
AdB	Adams loamy sand, 3 to 8 percent slopes	33.9	2.7%
AdC	Adams loamy sand, 8 to 15 percent slopes	7.2	0.6%
AdD	Adams loamy sand, 15 to 25 percent slopes	8.1	0.7%
AHC	Adams-Hermon association, strongly sloping	6.7	0.5%
CgB	Colton gravelly loamy sand, 3 to 8 percent slopes	57.5	4.6%
CgC	Colton gravelly loamy sand, 8 to 15 percent slopes	10.6	0.9%
CgD	Colton gravelly loamy sand, 15 to 25 percent slopes	55.0	4.4%
CHC	Colton-Adams association, strongly sloping	140.2	11.2%
CHD	Colton-Adams association, moderately steep	40.4	3.2%
CrB	Croghan loamy fine sand, 3 to 8 percent slopes	3.9	0.3%
DXD	Dixfield-Marlow association, moderately steep, very stony	7.4	0.6%
HTD	Hermon and Monadnock soils, moderately steep, very stony	16.1	1.3%
LtC	Lyman-Tunbridge complex, 8 to 15 percent slopes, very stony	9.3	0.7%
LtD	Lyman-Tunbridge complex, 15 to 35 percent slopes, very stony	43.9	3.5%
LWD	Lyman-Tunbridge-Monadnock complex, hilly, very stony	132.4	10.6%
LWE	Lyman-Tunbridge-Monadnock complex, very hilly, very stony	116.6	9.3%
Od	Ondawa fine sandy loam, occasionally flooded	57.6	4.6%
Pt	Podunk fine sandy loam, occasionally flooded	7.1	0.6%
Pw	Podunk fine sandy loam, frequently flooded	32.6	2.6%
Ru	Rumney fine sandy loam, occasionally flooded	26.1	2.1%
Ry	Rumney fine sandy loam, frequently flooded	97.2	7.8%
RZ	Rumney-Podunk association, frequently flooded	3.2	0.3%
STD	Skerry-Colonel association, moderately steep, very stony	47.9	3.8%
Su	Sunday loamy fine sand, occasionally flooded	3.0	0.2%
W	Water	124.9	10.0%
Subtotals for Soil Survey Area		**1,088.8**	**87.2%**
Totals for Area of Interest		**1,248.2**	**100.0%**

White Mountain National Forest, Maine (ME624)

White Mountain National Forest, Maine (ME624)		
No soil data available for this soil survey area.		
Totals for Area of Interest	**1,248.2**	**100.0%**

Oxford County Area, Maine

AdB—Adams loamy sand, 3 to 8 percent slopes

Map Unit Setting

Elevation: 300 to 2,200 feet
Mean annual precipitation: 30 to 48 inches
Mean annual air temperature: 37 to 46 degrees F
Frost-free period: 70 to 160 days

Map Unit Composition

Adams and similar soils: 85 percent

Description of Adams

Setting

Landform: Outwash terraces, outwash plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Rise
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Sandy glaciofluvial deposits derived from crystallin rock

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.7 inches)

Interpretive groups

Land capability (nonirrigated): 3s

Typical profile

0 to 1 inches: Highly decomposed plant material
1 to 2 inches: Loamy sand
2 to 19 inches: Loamy sand
19 to 65 inches: Sand

Data Source Information

Soil Survey Area: Oxford County Area, Maine
Survey Area Data: Version 11, Jan 27, 2009

Soil Survey Area: White Mountain National Forest, Maine
Survey Area Data: Version 0, Jan 1, 0001

Oxford County Area, Maine

CgB—Colton gravelly loamy sand, 3 to 8 percent slopes

Map Unit Setting

Elevation: 10 to 2,000 feet
Mean annual precipitation: 30 to 48 inches
Mean annual air temperature: 37 to 46 degrees F
Frost-free period: 90 to 160 days

Map Unit Composition

Colton and similar soils: 85 percent

Description of Colton

Setting

Landform: Outwash terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Sandy-skeletal glaciofluvial deposits derived from granite and gneiss

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.6 inches)

Interpretive groups

Land capability (nonirrigated): 3s

Typical profile

0 to 3 inches: Highly decomposed plant material
3 to 5 inches: Gravelly loamy sand
5 to 23 inches: Very gravelly loamy sand
23 to 65 inches: Extremely gravelly sand

Data Source Information

Soil Survey Area: Oxford County Area, Maine
Survey Area Data: Version 11, Jan 27, 2009

Soil Survey Area: White Mountain National Forest, Maine
Survey Area Data: Version 0, Jan 1, 0001

Oxford County Area, Maine

LtD—Lyman-Tunbridge complex, 15 to 35 percent slopes, very stony

Map Unit Setting

Elevation: 10 to 2,500 feet
Mean annual precipitation: 34 to 50 inches
Mean annual air temperature: 37 to 46 degrees F
Frost-free period: 60 to 160 days

Map Unit Composition

Lyman and similar soils: 50 percent
Tunbridge and similar soils: 30 percent

Description of Lyman

Setting

Landform: Ridges
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Coarse-loamy supraglacial meltout till derived from mica schist

Properties and qualities

Slope: 15 to 30 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.9 inches)

Interpretive groups

Land capability (nonirrigated): 7s

Typical profile

0 to 1 inches: Highly decomposed plant material
1 to 2 inches: Fine sandy loam
2 to 15 inches: Fine sandy loam
15 to 19 inches: Bedrock

Description of Tunbridge

Setting

Landform: Ridges
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Crest
Down-slope shape: Convex

Across-slope shape: Convex
Parent material: Coarse-loamy supraglacial meltout till derived from mica schist and/or coarse-loamy supraglacial meltout till derived from phyllite

Properties and qualities

Slope: 15 to 30 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: 20 to 30 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 4.4 inches)

Interpretive groups

Land capability (nonirrigated): 6s

Typical profile

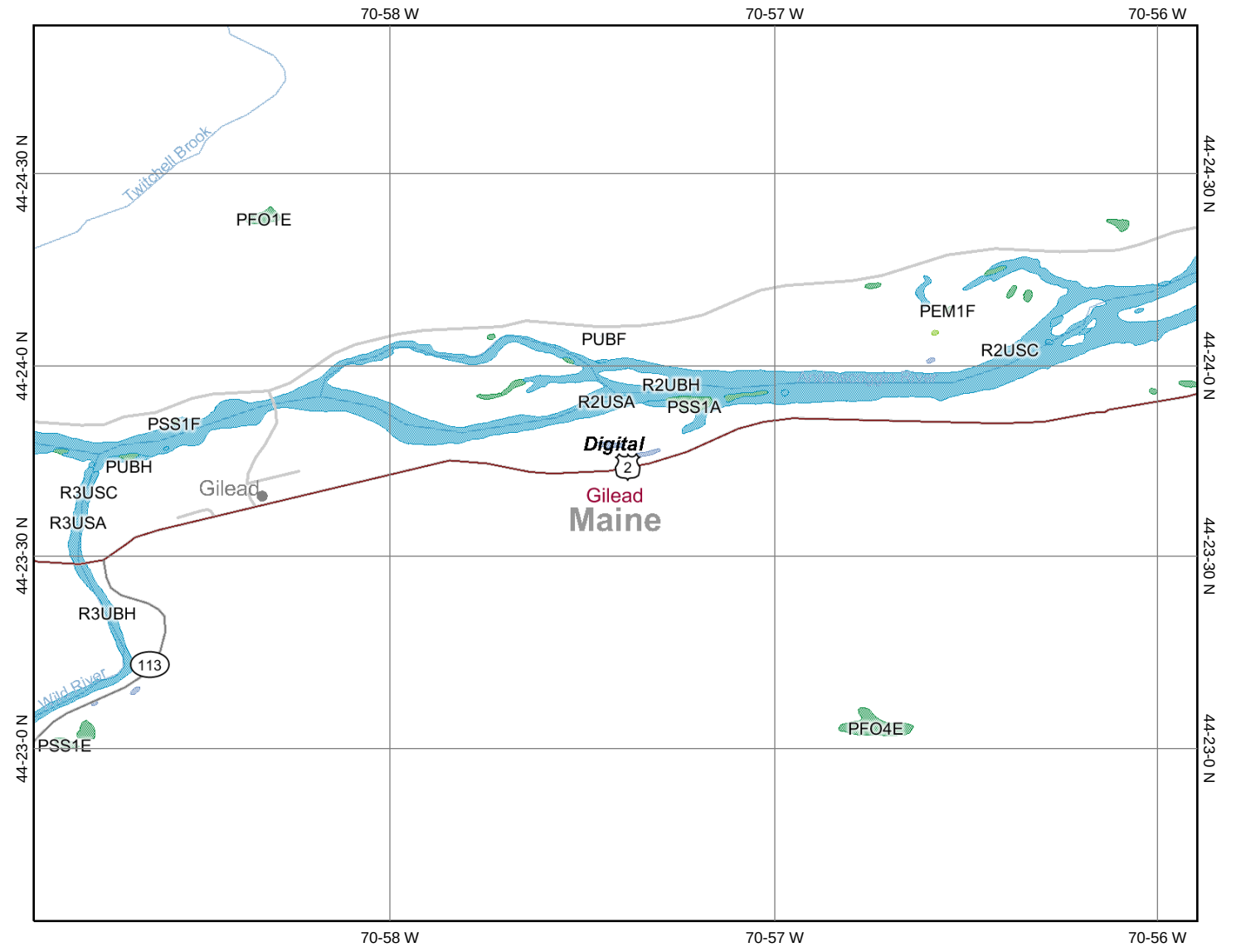
0 to 1 inches: Highly decomposed plant material
1 to 3 inches: Fine sandy loam
3 to 26 inches: Gravelly fine sandy loam
26 to 30 inches: Bedrock

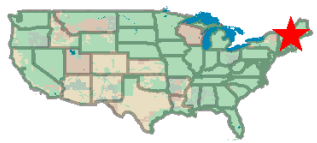
Data Source Information

Soil Survey Area: Oxford County Area, Maine
Survey Area Data: Version 11, Jan 27, 2009

Soil Survey Area: White Mountain National Forest, Maine
Survey Area Data: Version 0, Jan 1, 0001

Gilead Wetlands





Legend

- Interstate
- Major Roads
- Other Road
- Interstate
- State highway
- US highway
- Roads
- Cities
- USGS Quad Index 24K
- Lower 48 Wetland Polygons
- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine
- Lower 48 Available Wetland Data
- Non-Digital
- Digital
- No Data
- Scan
- NHD Streams
- Counties 100K
- States 100K
- South America
- North America

N

Scale: 1:30,289

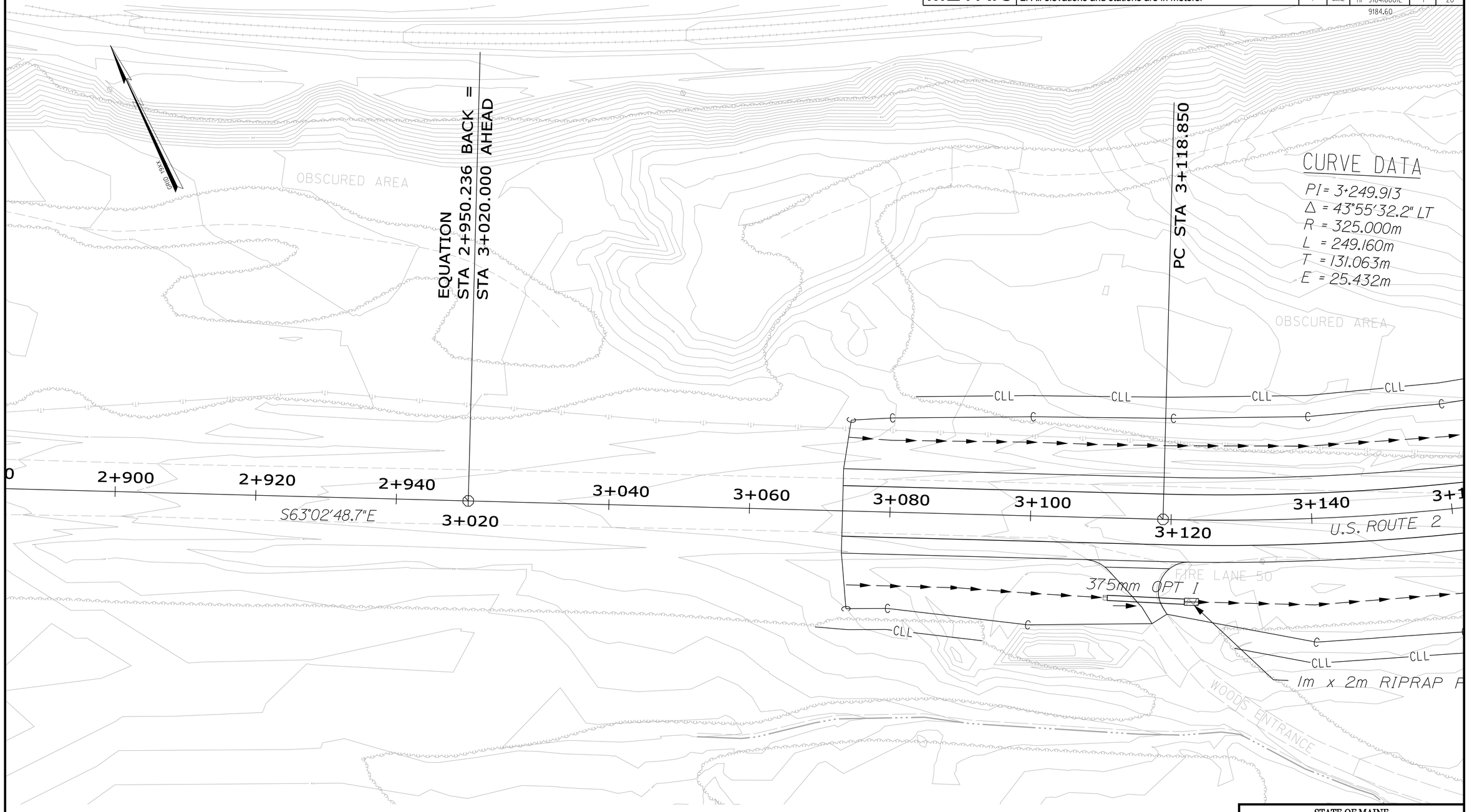
Map center: 44° 23' 43" N, 70° 57' 25" W

This map is a user generated static output from an Internet mapping site and is for general reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable. THIS MAP IS NOT TO BE USED FOR NAVIGATION.

Notes: National Wetlands Inventory, Gilead

Appendix B
Geoplans

METRIC	1. All dimensions are in millimeters unless otherwise noted. 2. All elevations and stations are in meters.	F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
		1	MAINE	HP-9184(600)E	1	20



PROJECT DESIGN ENGINEER	BY	DATE
DESIGN-DETAILED	K. BRESKIN	MAR 2009
CHECKED	T. WHITE	-----
REVISIONS	-----	-----
FIELD CHANGES	-----	-----

PLANS

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

PLANS

GILEAD

ROUTE 2

GEOPLANS

SHEET OF AUGUSTA, MAINE

Filename: ...\GEOTECH\MSTA\001_Geoplan1.dgn Division: GEOTECH Username: kitty.breskin Date:5/28/2009

METRIC

1. All dimensions are in millimeters unless otherwise noted.
2. All elevations and stations are in meters.

F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	HP-9184(600)E	2	20

CURVE DATA
PI = 3+249.913
Δ = 43°55'32.2" LT
R = 325.000m
L = 249.160m
T = 131.063m
E = 25.432m

CURVE DATA
PI = 3+249.913
Δ = 43°55'32.2" LT
R = 325.000m
L = 249.160m
T = 131.063m
E = 25.432m

9184.60

9184.010

OBSCURED AREA

GRID 19XX

CLL

C

U.S. ROUTE 2

3+140
3+160
3+180
3+200
3+220
3+240
3+260
3+280
3+300
3+320
3+340

P-3+100L
P-3+100R
P-4.57NR
HB-GILE-101
P-3+200L
P-3+200R

2.4m
3.9m

REMOVE (BY OTHERS)

BUILDING TO BE REMOVED BY OTHERS

LEVEL LIP SPREADER
TOP OF WEIR LENGTH = 3.7m (MIN.)

RIPRAP PAD

GRAVEL CAMP ENTRANCE

ARROW ADVERTISING

PFO

35 MPH

PROJECT DESIGN ENGINEER		BY	DATE
PLANS	DESIGN-DETAILED	K. BRESKIN	MAR 2009
	CHECKED	T. WHITE	-----
	REVISIONS	-----	-----
	FIELD CHANGES	-----	-----

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

PLANS

GILEAD

ROUTE 2

GEOPLANS

SHEET OF AUGUSTA, MAINE

Filename: ...\geotech\msta\002_Geoplan2.dgn Division: GEOTECH Username: kitty.breskin Date:5/28/2009

METRIC

1. All dimensions are in millimeters unless otherwise noted.
2. All elevations and stations are in meters.

F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	HP-9184(600)E	3	20

9184.60

WILD RIVER BRIDGE TO BE CONSTRUCTED UNDER SEPARATE CONTRACT

CONTO 19XX

PT STA 3+368.010

STA. 3+402.528

STA. 3+496.528

REMOVE (BY OTHERS)

RIVER EMBANKMENTS AND RIPRAP TO BE CONSTRUCTED IN THIS PROJECT

CLL

3+340 3+360 3+380 3+400 3+420 3+440 3+460 3+480 3+500 3+520

U.S. ROUTE 2

3.9m

LIMIT OF SELECT COMMON BORROW IN THIS PROJECT (TYP)

PIER RIPRAP BY OTHERS

WILD RIVER

m (MIN.)

LIMIT OF WORK PRIOR TO COORDINATION WITH BRIDGE CONTRACTOR (TYP)

PROJECT DESIGN ENGINEER		BY	DATE
PLANS	DESIGN-DETAILED	K. BRESKIN	MAR 2009
	CHECKED	T. WHITE	-----
	REVISIONS	-----	-----
	FIELD CHANGES	-----	-----

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

PLANS

GILEAD

ROUTE 2

GEOPLANS

SHEET OF AUGUSTA, MAINE

Filename: ...\geotech\msta\003_Geoplan3.dgn Division: GEOTECH Username: kitty.breskin Date:5/28/2009

METRIC	1. All dimensions are in millimeters unless otherwise noted. 2. All elevations and stations are in meters.	F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
		1	MAINE	HP-9184(600)E	4	20

9184.60

GRID 19XX

STA 3+660.000 U.S. ROUTE 2
STA 0+000.000 STATE ROUT

REMOVE (INCID. TO ITEM 202.08 REMOVE BUILDING NO.1)

REMOVE BUILDING NO.1

REMOVE

CLL C F

CMP 12S

3.9m

2.4m

3+520 3+540 3+560 3+580 3+600 3+620 3+640 3+660 3+680 3+700

0+000

N73°01'39.1"E

90°-00'-00.0"

S16°58'20.9"E

3.9m

2.4m

CLEARING

SELECT COMMON
N THIS PROJECT

PC STA
0+011.557

0+020

1m x 2m
RIPRAP PAD

450 mm RCP
CLASS III

450 mm RCP
CLASS III

SEE DETAIL A

REMOVE
OTHERS)

CMP 13

HB-GILE-04

0+040

CMP 12S

GRAVEL DRIVE

HOUSE

GARAGE

58mm PINE

MAPLE

BIRCH

TELEPHONE CABLE THRU BIRCH

TELEPHONE CON. BOX

PROJECT DESIGN ENGINEER	BY	DATE
DESIGN-DETAILED	K. BRESKIN	MAR 2009
CHECKED	T. WHITE	-----
REVISIONS	-----	-----
FIELD CHANGES	-----	-----

PLANS

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

PLANS

GILEAD

ROUTE 2

GEOPLANS

SHEET OF AUGUSTA, MAINE

Filename: ...\geotech\vmsto\004_Geoplan4.dgn Division: GEOTECH Username: kitty.breskin Date:5/28/2009

METRIC
1. All dimensions are in millimeters unless otherwise noted.
2. All elevations and stations are in meters.

F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	HP-9184(600)E	5	20

9184.60

U.S. ROUTE 2 = STATE ROUTE 113

CMP 19YK

REM
(BY

REMOV

CLL C CLL C CLL C CLL C CLL C CLL C CLL C

CMP 11Ø
CMP 10Ø NATIONAL FOREST
CMP 9Ø CONTEL BURIED CABLE
ARROW MEET
CMP 7
CMP 6

3+720 3+740 3+760 3+780 3+800 3+820 3+840 3+860 3+880 3+900

N73°01'39.1"E U.S. ROUTE 2

UD-B 300mm UD-C 300mm UD-C

CMP 11
CMP 9
CMP 8
CMP 7
CMP

GRAVEL DRIVE
HOUSE
WOODS ENTRANCE
CLEARING
OBSCURED AREA
350mm SPRUCE
SHRUB
610mm TREE
970mm TREE
GRAVEL DRIVE
SAVE SHRUB
REMOVE
(REMOVAL OF STUMP SHALL BE INCIDENTAL TO ITEM 203.20)
REMOVE (IN
TO ITEM 20
EE DETAIL A
GARAGE

PROJECT DESIGN ENGINEER	BY	DATE
DESIGN-DETAILED	K. BRESKIN	T. WHITE	MAR 2009
CHECKED	-----	-----	-----
REVISIONS	------	------	------
FIELD CHANGES			

PLANS

Filename: ...\geotech\msta\005_Geoplan5.dgn Division: GEOTECH Username: kitty.breskin Date:5/28/2009

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

PLANS

GILEAD

ROUTE 2

GEOPLANS

SHEET OF AUGUSTA, MAINE

METRIC 1. All dimensions are in millimeters unless otherwise noted. 2. All elevations and stations are in meters.

F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	HP-9184(600)E	6	20

FIRE LANE 40

CURVE DATA

PI = 100+040.252
Δ = 5°19'18.2" RT
R = 200.000m
L = 18.576m
T = 9.295m
E = 0.216m

PT STA 100+049.534

PC STA 100+030.957

STA 100+016.000
MATCH EXISTING PAVEMENT
LIMIT OF WORK

REMOVE SIGN
(BY OTHERS)

PT 3+952.423
16.000m LT

STA. 3+942.423
16.000m LT
10.0m R

PC 3+942.423
6.000m LT

REMOVE

CLL

90°-00'-00.0"

PC 3+960.277
15.053m LT

STA. 3+972.663
19.000m LT
13.0m R

PT 3+972.663
6.000m LT

N11°39'02.7"W

N16°58'20.9"W

100+060

100+040

100+020

FIRE LANE 40

GRID 19°W

3+900 3+920 3+940 3+960 3+980 4+000 4+020 4+040 4+060 4+080

U.S. ROUTE 2

N73°01'39.1"E

HB-01LE-105

300mm UD-C

300mm UD-C

CMP 6

CMP 5

CMP 4

CMP 3

CMP 2

REMOVE (INCID.
TO ITEM 203.20)

REMOVE

300 mm OPTIII

450 mm RCP
CLASS III

STA 3+955.720 U.S. ROUTE 2 =
STA 100+000.000 FIRE LANE 40

STA. 4+057.332
20.000m LT
14.0m R

PC 4+057.332
6.000m LT

PT 4+070.591
15.506m LT

CLUMP OF
50mm CHERRY

BROKEN UP
PAVEMENT

STORE

HOUSE

530mm MA

BRIDGE STREET

200+080

200+060

200+040

200+020

N16°48'07.5"W

BRIDG
CUR
PI = 2
Δ = 2
R = 1
L = 7
T = 3
E = 3

STA 200+0
MATCH EX
LIMIT OF W

PC 4+080.189
15.580m LT

PC STA 20

STA 4+075.2
STA 200+00

P-4(

CUBE
BOAT
LAUNC

PROJECT DESIGN ENGINEER	BY	DATE
DESIGN-DETAILED	K. BRESKIN	MAR 2009
CHECKED	-----	-----
REVISIONS	-----	-----
FIELD CHANGES	-----	-----

PLANS

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

PLANS

GILEAD
ROUTE 2

GEOPLANS

SHEET OF AUGUSTA, MAINE

Filename: ...\geotech\msta\006_Geoplan6.dgn Division: GEOTECH Username: kitty.breskin Date:5/28/2009

METRIC

1. All dimensions are in millimeters unless otherwise noted.
2. All elevations and stations are in meters.

F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	HP-9184(600)E	7	20

9184.60

PT STA 200+085.244

200+080

200+060

200+040

200+020

BRIDGE STREET

BRIDGE STREET
CURVE DATA

PI = 200+050.594
Δ = 21°43'38.7" RT
R = 185.000m
L = 70.155m
T = 35.504m
E = 3.376m

GRID 19KX

STA 200+016.000
MATCH EXISTING PAVEMENT
LIMIT OF WORK

STA. 4+094.175
21.000m LT
15.0m R

PC 4+080.189
15.580m LT

PT 4+094.175
6.000m LT

PC STA 200+015.090

N6°48'07.5"W

PC STA 4+273.057

CLL

N73°01'39.1"E

P-4+100L
P-4+100R
P-4+200L
P-4+200R

4+080
4+100
4+120
4+140
4+160
4+180
4+200
4+220
4+240
4+260

300mm UD-C
CMP 2.1
CMP 1

STA 4+075.269 U.S. ROUTE 2 =
STA 200+000.000 BRIDGE STREET

32mm PINE
32mm POPLAR CLUMP OF 4
32mm TREE CLUMP
530mm MAPLE
840mm MAPLE
840mm MAPLE
840mm MAPLE
70mm MAPLE
80mm MAPLE
50mm MAPLE
80mm MAPLE
80mm MAPLE
390mm SPRUCE
PUBLIC BOAT LAUNCH
PAVED DRIVE
PAVED DRIVE
AVEL DRIVE
RIVE

PROJECT DESIGN ENGINEER	BY	DATE
DESIGN-DETAILED	K. BRESKIN	MAR 2009
CHECKED	T. WHITE	-----
REVISIONS	-----	-----
FIELD CHANGES	-----	-----

PLANS

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

PLANS

GILEAD
ROUTE 2

GEOPLANS

SHEET OF AUGUSTA, MAINE

Filename: ...\geotech\msto\007_Geoplan7.dgn Division: GEOTECH Username: kitty.breskin Date:5/28/2009

METRIC 1. All dimensions are in millimeters unless otherwise noted. 2. All elevations and stations are in meters.

F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	HP-9184(600)E	8	20

9184.60

PC STA 4+273

GRID 19YX

CURVE DATA

PI = 4+400.033
Δ = 1°27'17.8" LT
R = 10000.000m
L = 253.938m
T = 126.976m
E = 0.806m

POOR CONDITION

REMOVE

REMOVE

CLL

C

P-4+300L

SECURED AREA

RAILROAD CROSSING

4+260 4+280 4+300 4+320 4+340 4+360 4+380 4+400 4+420 4+440 4+460

U.S. ROUTE 2

2.4m

3.9m

300 mm OPT III

P-4+300R

900 mm RCP CLASS III

mm MAPLE

E

1m x 2m RIPRAP PAD

PROJECT DESIGN ENGINEER		BY	DATE
PLANS	DESIGN-DETAILED	K. BRESKIN	MAR 2009
	CHECKED	-----	
	REVISIONS	------	------
	FIELD CHANGES		

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

PLANS

GILEAD
ROUTE 2

GEOPLANS

SHEET OF AUGUSTA, MAINE

Filename: ...\geotech\msta\008_Geoplan8.dgn Division: GEOTECH Username: kitty.breskin Date:5/28/2009

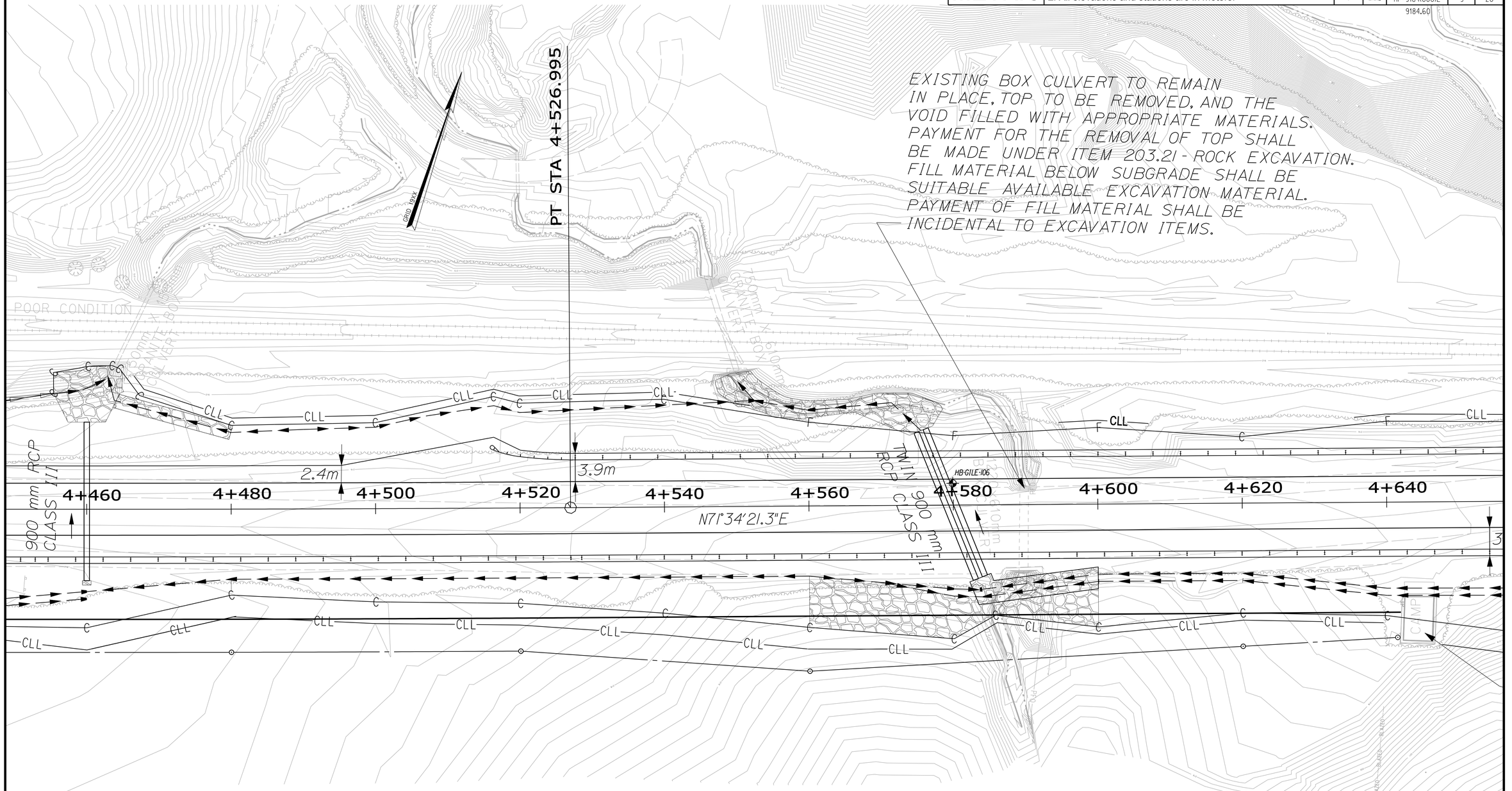
Filename: ...\geotech\vmsto\009_Geoplan9.dgn Division: GEOTECH Username: kitty.breskin Date:5/28/2009

METRIC	1. All dimensions are in millimeters unless otherwise noted. 2. All elevations and stations are in meters.

F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	HP-9184(600)E	9	20

9184.60

EXISTING BOX CULVERT TO REMAIN IN PLACE, TOP TO BE REMOVED, AND THE VOID FILLED WITH APPROPRIATE MATERIALS. PAYMENT FOR THE REMOVAL OF TOP SHALL BE MADE UNDER ITEM 203.21 - ROCK EXCAVATION. FILL MATERIAL BELOW SUBGRADE SHALL BE SUITABLE AVAILABLE EXCAVATION MATERIAL. PAYMENT OF FILL MATERIAL SHALL BE INCIDENTAL TO EXCAVATION ITEMS.


PT STA 4+526.995
GRID 90°
POOR CONDITION
STONE BOX CULVERT
STONE BOX CULVERT
CLL
C
F
2.4m
3.9m
900 mm RCP CLASS III
TWIN 900 mm RCP CLASS III
HB-GILE-106
4+460
4+480
4+500
4+520
4+540
4+560
4+580
4+600
4+620
4+640
N71°34'21.3"E
BLASTED ROCK
BLASTED ROCK
BLASTED ROCK

METRIC
1. All dimensions are in millimeters unless otherwise noted.
2. All elevations and stations are are in meters.

F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	HP-9184(600)E	10	20

9184.60

TION.

REMOVE CULVERT AND STONE WINGWALLS INCIDENTAL TO ITEM 203.20

EXCESSIVE SHADOW AREA

REMOVE

REMOVE

CLL CLL

4+640 4+660 4+680 4+700 4+720 4+740 4+760 4+780 4+800 4+820

600 mm RCP CLASS III

N71°34'21.3"E

3.9m 2.4m

HB-GILE-III

B-4-800L HB-GILE-II2

U.S. ROUTE 2

P-1.22R

REMOVE BUILDING NO. 2

PC STA 4+734.421

EXCESSIVE SHADOW AREA

PROJECT DESIGN ENGINEER	BY	DATE
DESIGN-DETAILED	K. BRESKIN	MAR 2009
CHECKED	-----	
REVISIONS	------	------
FIELD CHANGES		

PLANS

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

PLANS

GILEAD

ROUTE 2

GEOPLANS

SHEET OF AUGUSTA, MAINE

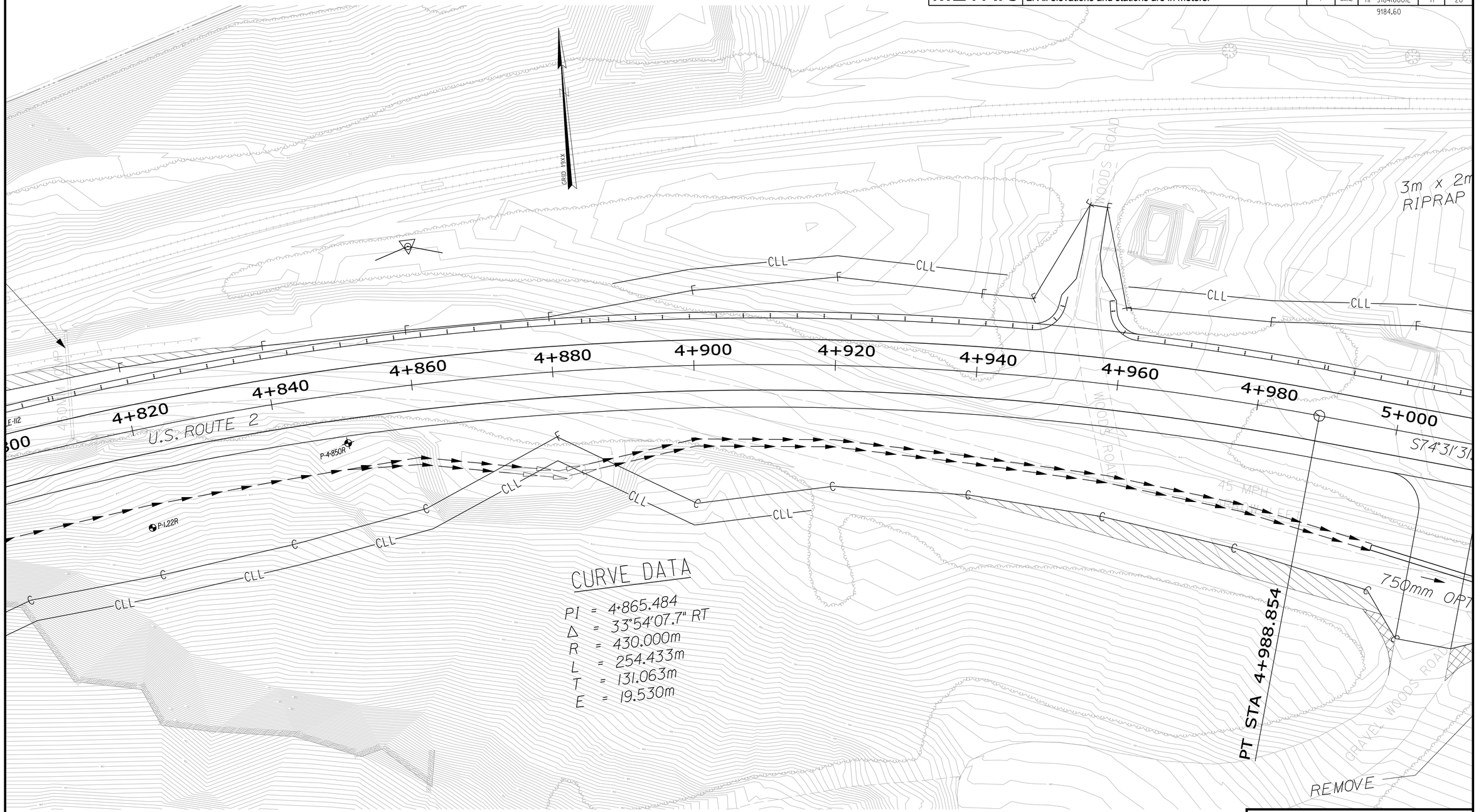
Filename: ...\geotech\msto\010_Geoplan10.dgn Division: GEOTECH Username: kitty.breskin Date:5/28/2009

METRIC

1. All dimensions are in millimeters unless otherwise noted.
2. All elevations and stations are in meters.

F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	HP-9184(600)E	11	20

9184.60



CURVE DATA

PI = 4+865.484
Δ = 33°54'07.7" RT
R = 430.000m
L = 254.433m
T = 131.063m
E = 19.530m

PROJECT DESIGN ENGINEER	BY	DATE
DESIGN-DETAILED	K. BRESKIN	MAR 2009
CHECKED	-----	
REVISIONS	-----	-----
FIELD CHANGES		

PLANS

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

PLANS

GILEAD
ROUTE 2

GEOPLANS

SHEET OF AUGUSTA, MAINE

Filename: ...\geotech\msta\011_Geoplan11.dgn Division: GEOTECH Username: kitty.breskin Date:5/28/2009

METRIC 1. All dimensions are in millimeters unless otherwise noted.
2. All elevations and stations are in meters.

F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	HP-9184(600)E	12	20

9184.60

3m x 2m x 1m DEEP RIPRAP PLUNGE POOL

4m x 3m x 1m DEEP RIPRAP PLUNGE POOL

CLL

+980 5+000 5+020 5+040 5+060 5+080 5+100 5+120 5+140 5+160 5+180

S74°31'31.0"E

B-5-100L

B-5-100L(a)

750 mm RCP CLASS III

900 mm RCP CLASS IV

750mm OPT I

750mm CMP

1m x 1m BOX W/ 1m CULVERT

PT STA 4+988.854

REMOVE

REMOVE CULVERT AND BOX

GRAVEL WOODS ROAD

OBSCURED AREA

SNOWMOBILE TRAIL

PROJECT DESIGN ENGINEER	BY	DATE
DESIGN-DETAILED	K. BRESKIN	MAR 2009
CHECKED	-----	-----
REVISIONS	-----	-----
FIELD CHANGES	-----	-----

PLANS

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

PLANS

GILEAD

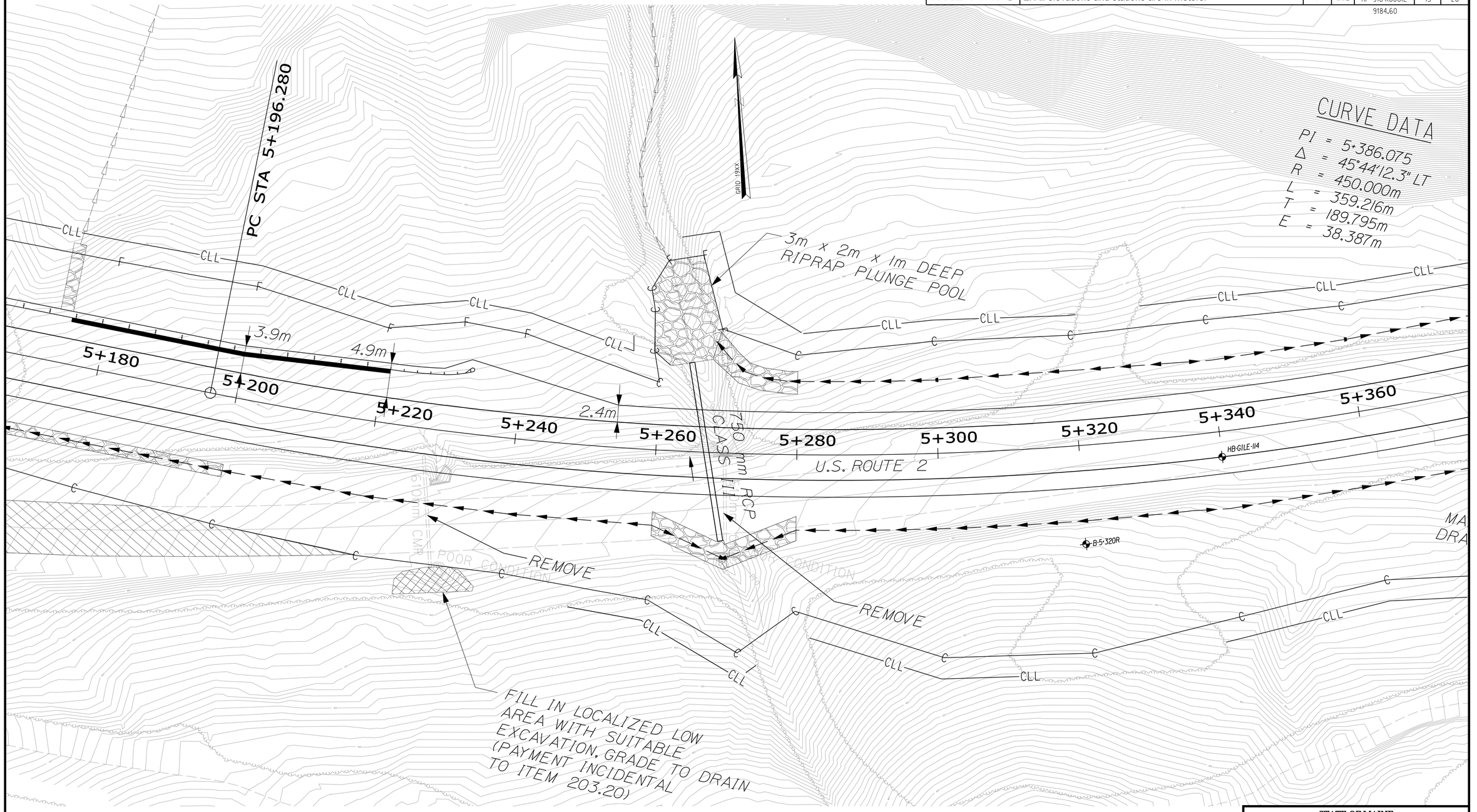
ROUTE 2

GEOPLANS

SHEET OF AUGUSTA, MAINE

Filename: ...\geotech\vmsto\012_Geoplan12.dgn Division: GEOTECH Username: kitty.breskin Date:5/28/2009

METRIC	1. All dimensions are in millimeters unless otherwise noted. 2. All elevations and stations are in meters.	F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
		1	MAINE	HP-9184(600)E	13	20
				9184.60		



PROJECT DESIGN ENGINEER	BY	DATE
DESIGN-DETAILED	K. BRESKIN	MAR 2009
CHECKED	T. WHITE	
REVISIONS		
FIELD CHANGES		

PLANS

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

PLANS

GILEAD

ROUTE 2

GEOPLANS

SHEET OF AUGUSTA, MAINE

Filename: ...\geotech\msta\013_Geoplan13.dgn Division: GEOTECH Username: kitty.breskin Date:5/28/2009

METRIC

1. All dimensions are in millimeters unless otherwise noted.
2. All elevations and stations are in meters.

F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	HP-9184(600)E	14	20

CURVE DATA
PI = 5+386.075
Δ = 45°44'12.3" LT
R = 450.000m
L = 359.216m
T = 189.795m
E = 38.387m

CURVE DATA
PI = 5+386.075
Δ = 45°44'12.3" LT
R = 450.000m
L = 359.216m
T = 189.795m
E = 38.387m

6m x 4m x 1m DEEP RIPRAP PLUNGE POOL

REMOVE

REMOVE

CLEARING

CLEARING

PT STA 5+555.4

9184.60

CLL

5+360 5+380 5+400 5+420 5+440 5+460 5+480 5+500 5+520 5+540

3.9m

2.4m

TWIN 750 mm RCP CLASS III

P-5-380R

MAINTAIN DRAINAGE

SNOWMOBILE TRAIL

APPROXIMATE TREELINE

SNOWMOBILE BRIDGE (BY OTHERS)

EXCESSIVE SHADOW AREA

APPROXIMATE TREELINE

PROJECT DESIGN ENGINEER		BY	DATE
PLANS	DESIGN-DETAILED	K. BRESKIN	MAR 2009
	CHECKED	-----	-----
	REVISIONS	-----	-----
	FIELD CHANGES	-----	-----

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

PLANS

GILEAD

ROUTE 2

GEOPLANS

SHEET OF AUGUSTA, MAINE

Filename: ...\geotech\msto\014_Geoplan14.dgn Username: kitty.breskin Date:5/28/2009 Division: GEOTECH

METRIC

1. All dimensions are in millimeters unless otherwise noted.
2. All elevations and stations are in meters.

F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	HP-9184(600)E	15	20

9184.60

PT STA 5+555.49

7m x 7m HEAVY RIPRAP PAD

7m x 7m HEAVY RIPRAP PAD

REMOVE

CLL

HB-GILE-602

HB-GILE-601

5+560 5+580 5+600 5+620 5+640 5+660 5+700 5+720 5+740

750 mm RCP CLASS III N59°44'16.7"E

N59°44'16.7"E

750 mm RCP CLASS III

610mm CMP

406mm CMP

U.S. ROUTE 2

GOOD CONDITION

GOOD CONDITION

CLEARING

REMOVE

CLEARING

MAINTAIN DRAINAGE

RELOCATED SNOWMOBILE TRAIL

CLEARING

REMOVE

SNOWMOBILE TRAIL

CLEARING

RELOCATED SNOWMOBILE TRAIL

P-1.52R

P-1R

PC STA 5+644.676

EXCESSIVE SHADOW AREA

CURVE D

PI = 6+007.3
Δ = 33°38'0
R = 1200.00
L = 704.45
T = 362.70
E = 53.616

PROJECT DESIGN ENGINEER	BY	DATE
DESIGN-DETAILED	K. BRESKIN	MAR 2009
CHECKED	T. WHITE	-----
REVISIONS	-----	-----
FIELD CHANGES	-----	-----

PLANS

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

PLANS

GILEAD

ROUTE 2

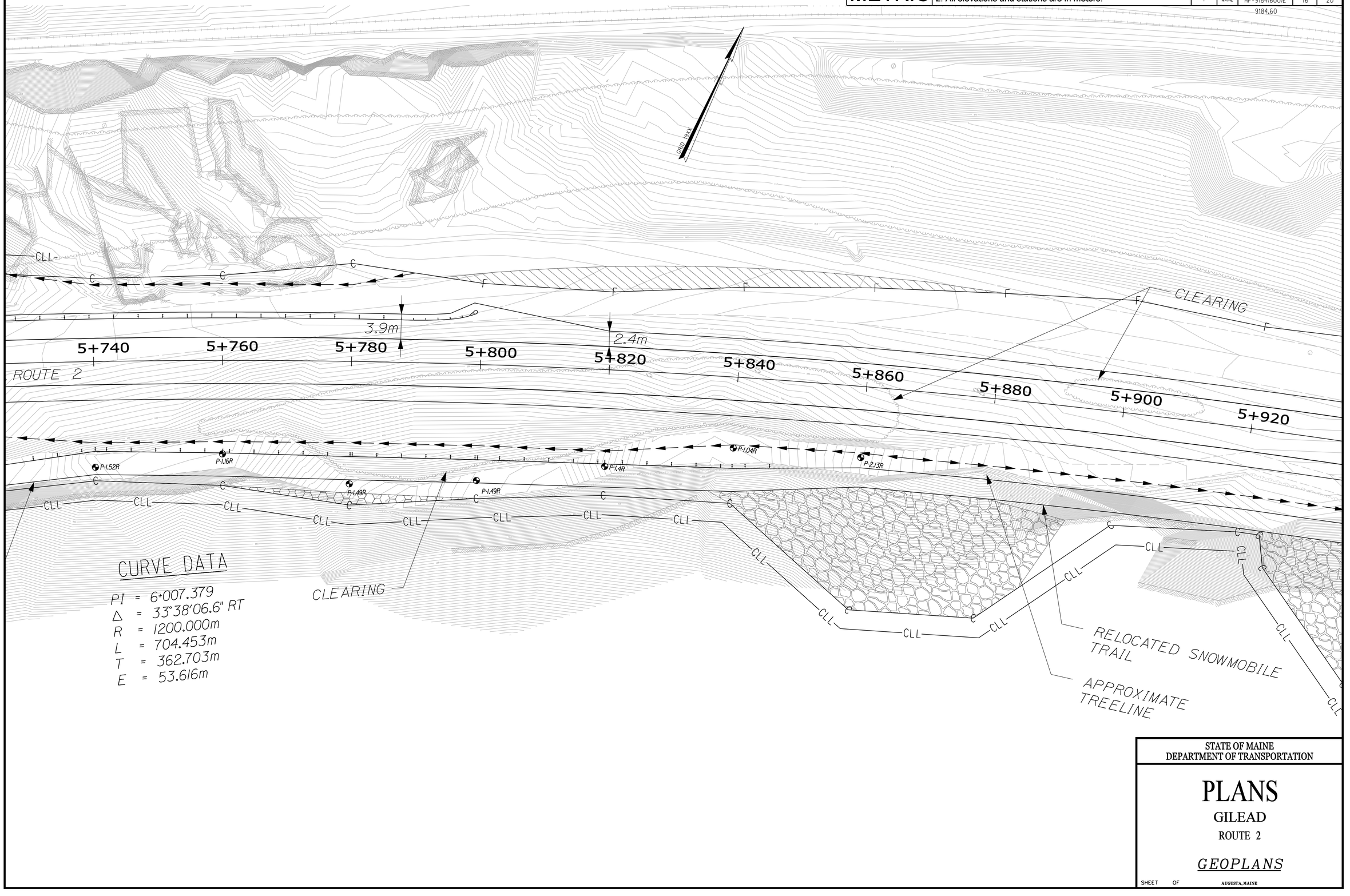
GEOPLANS

SHEET OF AUGUSTA, MAINE

Filename: ...\geotech\msla\015_Geoplan15.dgn Division: GEOTECH Username: kitty.breskin Date:5/28/2009

METRIC	1. All dimensions are in millimeters unless otherwise noted. 2. All elevations and stations are in meters.	F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
		1	MAINE	HP-9184(600)E	16	20

9184.60



PROJECT DESIGN ENGINEER	BY	DATE
DESIGN-DETAILED	K. BRESKIN	T. WHITE
CHECKED	-----	-----
REVISIONS	-----	-----
FIELD CHANGES	-----	-----

PLANS

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

PLANS

GILEAD

ROUTE 2

GEOPLANS

SHEET OF AUGUSTA, MAINE

Filename: ...\geotech\rnsta\016_Geoplan16.dgn Division: GEOTECH Username: kitty.breskin Date:5/28/2009

METRIC

1. All dimensions are in millimeters unless otherwise noted.
2. All elevations and stations are in meters.

F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	HP-9184(600)E	17	20

9184.60

DRIVEWAY

2m x 1.5m x 1m DEEP RIPRAP PLUNGE POOL

CLEARING

REMOVE

406mm CMP

600 mm RCP CLASS III

5+920 5+940 5+960 5+980 6+000 6+020 6+040 6+060 6+080 6+100 6+1

U.S. ROUTE 2

SNOWMOBILE TRAIL

SNOWMOBILE

P-1/6R

CLL

CURVE DATA

PI = 6+007.379
Δ = 33°38'06.6" RT
R = 1200.000m
L = 704.453m
T = 362.703m
E = 53.616m

PROJECT DESIGN ENGINEER	BY	DATE
DESIGN-DETAILED	K. BRESKIN	MAR 2009
CHECKED	T. WHITE	------
REVISIONS	------	------
FIELD CHANGES	------	------

PLANS

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

PLANS

GILEAD
ROUTE 2

GEOPLANS

SHEET OF AUGUSTA, MAINE

Filename: ...\geotech\msta\017_Geoplan17.dgn Division: GEOTECH Username: kitty.breskin Date:5/28/2009

METRIC

1. All dimensions are in millimeters unless otherwise noted.
2. All elevations and stations are in meters.

F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	HP-9184(600)E	18	20

9184.60

GRID 19XX

CLL C CLL C CLL C CLL C CLL F CLL C CLL F

2.4m

3.9m

6+100 6+120 6+140 6+160 6+180 6+200 6+220 6+240 6+260 6+280 6+300

U.S. ROUTE 2

C C C

METRIC

1. All dimensions are in millimeters unless otherwise noted.
2. All elevations and stations are in meters.

F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	HP-9184(600)E	19	20

9184.60

PROPOSED GUARDRAIL
SHALL MATCH GUARDRAIL
FROM PROJECT HP-9184(500)E

CLL

6+300 6+320 6+340 6+360 6+380 6+400 6+420 6+440 6+460 6+480

U.S. ROUTE 2

S56°37'36.7"E

WOODS ENTRANCE

PT STA 6+349.129

PROJECT DESIGN ENGINEER		BY	DATE
PLANS	DESIGN-DETAILED	K. BRESKIN	MAR 2009
	CHECKED	T. WHITE	-----
	REVISIONS	-----	-----
	FIELD CHANGES	-----	-----

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

PLANS

GILEAD

ROUTE 2

GEOPLANS

SHEET OF AUGUSTA, MAINE

Filename: ...\geotech\msto\019_Geoplan19.dgn Division: GEOTECH Username: kitty.breskin Date:5/28/2009

METRIC

1. All dimensions are in millimeters unless otherwise noted.
2. All elevations and stations are in meters.

F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	HP-9184(600)E	20	20

9184.60

ROUTE 113
CURVE DATA
PI = 0+136.494
Δ = 7°13'39.9" LT
R = 423.000m
L = 53.361m
T = 26.716m
E = 0.843m

PRC STA 0+163.139

ROUTE 113
CURVE DATA
PI = 0+136.494
Δ = 7°13'39.9" LT
R = 423.000m
L = 53.361m
T = 26.716m
E = 0.843m

REMOVE (BY OTHERS)

CLEARING

1m x 2m RIPRAP PAD

3+600
3+620
3+640
3.9m
2.4m
90°-00'-00.0"

PC STA 0+011.557

450 mm CLASS III RCP

0+020

0+040
0+060
0+080
0+100
0+120
0+140
0+160
0+180
0+200
0+220

STATE ROUTE 113

CMP 14
CMP 13
1.2m
3.3m
3.3m
S41°57'14.3"W
UD-B
HB-GILE-104

PCC STA 0+220.829

PC STA 0+109.778

STA 0+098.500
END FULL DEPTH RECONSTRUCTION
BEGIN RESURFACING

PT STA 0+042.411

ROUTE 113
CURVE DATA
PI = 0+028.505
Δ = 58°55'35.2" RT
R = 30.000m
L = 30.854m
T = 16.948m
E = 4.456m

ROUTE 113
CURVE DATA
PI = 0+193.064
Δ = 37°33'41.9" LT
R = 88.000m
L = 57.691m
T = 29.925m
E = 4.949m

ROUTE 113
CURVE DATA
PI = 0+246
Δ = 2°
R =

HOUSE
GARAGE
GRAVEL ENTRANCE
EVANS NOTCH MOTEL OFFICE
PAVEMENT
PLANTER W/SIGN
BURIED CABLE
TELEPHONE CONDUIT
LAWN
MAPLE SYRUP HOUSE
SHRUB W/160mm TREE
105mm TREE
145mm TREE
CONCRETE WALL
300mm PIPE
300mm TALL
195mm BEECH
500mm OAK
GRID 19XX
CMP 14
CMP 15
CMP 16
CMP 17
STOP
ARROW RIGHT
ARROW LT
ARROW RT.
GORHAM NH
BETHEL ME
16 A 139 Ø
FISH BOX
TELEPHONE MANHOLE
GRAVEL ROAD

PROJECT DESIGN ENGINEER		BY	DATE
PLANS	DESIGN-DETAILED	K. BRESKIN	T. WHITE	MAR 2009
	CHECKED	-----	-----	-----
	REVISIONS	-----	-----	-----
	FIELD CHANGES			

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

PLANS

GILEAD

ROUTE 2

GEOPLANS

SHEET OF AUGUSTA, MAINE

Filename: ...\geotech\mslo\020_Geoplan20.dgn Division: GEOTECH Username: kitty.breskin Date:5/28/2009

Appendix C
Field Exploration Data
Soils Descriptions
Boring Logs
Probe Summary Sheet

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES
COARSE-GRAINED SOILS (more than half of material is larger than No. 200 sieve size)	GRAVELS (more than half of coarse fraction is larger than No. 4 sieve size)	CLEAN GRAVELS (little or no fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines
			GP	Poorly-graded gravels, gravel sand mixtures, little or no fines
		GRAVEL WITH FINES (Appreciable amount of fines)	GM	Silty gravels, gravel-sand-silt mixtures.
			GC	Clayey gravels, gravel-sand-clay mixtures.
	SANDS (more than half of coarse fraction is smaller than No. 4 sieve size)	CLEAN SANDS (little or no fines)	SW	Well-graded sands, gravelly sands, little or no fines
			SP	Poorly-graded sands, gravelly sand, little or no fines.
		SANDS WITH FINES (Appreciable amount of fines)	SM	Silty sands, sand-silt mixtures
			SC	Clayey sands, sand-clay mixtures.
FINE-GRAINED SOILS (more than half of material is smaller than No. 200 sieve size)	SILTS AND CLAYS (liquid limit less than 50)		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity.
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
			OL	Organic silts and organic silty clays of low plasticity.
	SILTS AND CLAYS (liquid limit greater than 50)		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
			CH	Inorganic clays of high plasticity, fat clays.
			OH	Organic clays of medium to high plasticity, organic silts
	HIGHLY ORGANIC SOILS		Pt	Peat and other highly organic soils.

Desired Soil Observations: (in this order)

Color (Munsell color chart)
Moisture (dry, damp, moist, wet, saturated)
Density/Consistency (from above right hand side)
Name (sand, silty sand, clay, etc., including portions - trace, little, etc.)
Gradation (well-graded, poorly-graded, uniform, etc.)
Plasticity (non-plastic, slightly plastic, moderately plastic, highly plastic)
Structure (layering, fractures, cracks, etc.)
Bonding (well, moderately, loosely, etc., if applicable)
Cementation (weak, moderate, or strong, if applicable, ASTM D 2488)
Geologic Origin (till, marine clay, alluvium, etc.)
Unified Soil Classification Designation
Groundwater level

Maine Department of Transportation
Geotechnical Section
Key to Soil and Rock Descriptions and Terms
Field Identification Information

TERMS DESCRIBING DENSITY/CONSISTENCY

Coarse-grained soils (more than half of material is larger than No. 200 sieve): Includes (1) clean gravels; (2) silty or clayey gravels; and (3) silty, clayey or gravelly sands. Consistency is rated according to standard penetration resistance.

Modified Burmister System

Descriptive Term	Portion of Total
trace	0% - 10%
little	11% - 20%
some	21% - 35%
adjective (e.g. sandy, clayey)	36% - 50%

Density of Cohesionless Soils	Standard Penetration Resistance N-Value (blows per foot)
Very loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

Fine-grained soils (more than half of material is smaller than No. 200 sieve): Includes (1) inorganic and organic silts and clays; (2) gravelly, sandy or silty clays; and (3) clayey silts. Consistency is rated according to shear strength as indicated.

Consistency of Cohesive soils	SPT N-Value blows per foot	Approximate Undrained Shear Strength (psf)	Field Guidelines
Very Soft	WOH, WOR, WOP, <2	0 - 250	Fist easily Penetrates
Soft	2 - 4	250 - 500	Thumb easily penetrates
Medium Stiff	5 - 8	500 - 1000	Thumb penetrates with moderate effort
Stiff	9 - 15	1000 - 2000	Indented by thumb with great effort
Very Stiff	16 - 30	2000 - 4000	Indented by thumbnai
Hard	>30	over 4000	Indented by thumbnail with difficulty

Rock Quality Designation (RQD):

$$RQD = \frac{\text{sum of the lengths of intact pieces of core* > 100 mm}}{\text{length of core advance}}$$

*Minimum NQ rock core (1.88 in. OD of core)

Correlation of RQD to Rock Mass Quality

Rock Mass Quality	RQD
Very Poor	<25%
Poor	26% - 50%
Fair	51% - 75%
Good	76% - 90%
Excellent	91% - 100%

Desired Rock Observations: (in this order)

Color (Munsell color chart)
Texture (aphanitic, fine-grained, etc.)
Lithology (igneous, sedimentary, metamorphic, etc.)
Hardness (very hard, hard, mod. hard, etc.)
Weathering (fresh, very slight, slight, moderate, mod. severe, severe, etc.)
Geologic discontinuities/jointing:
- -dip (horiz - 0-5, low angle - 5-35, mod. dipping - 35-55, steep - 55-85, vertical - 85-90)
- -spacing (very close - <5 cm, close - 5-30 cm, mod. close 30-100 cm, wide - 1-3 m, very wide >3 m)
- -tightness (tight, open or healed)
- -infilling (grain size, color, etc.)

Formation (Waterville, Ellsworth, Cape Elizabeth, etc.)
RQD and correlation to rock mass quality (very poor, poor, etc.)
ref: AASHTO Standard Specification for Highway Bridges 17th Ed. Table 4.4.8.1.2A
Recovery

Sample Container Labeling Requirements:

PIN
Bridge Name / Town
Boring Number
Sample Number
Sample Depth
Blow Counts
Sample Recovery
Date
Personnel Initials

Maine Department of Transportation

Soil/Rock Exploration Log
METRIC UNITS

Project: Route 2
Location: Gilead, Maine

Boring No.: HB-GILE-101
PIN: 9184.60

Driller:	Northern Test Boring	**Elevation (m):**	221.60	**Auger ID/OD:**	2 1/4"-5 3/4"
Operator:	Mike/Nick	**Datum:**	NAVD 88	**Sampler:**	Standard Split Spoon
Logged By:	B. Wilder	**Rig Type:**	Diedrich D-50	**Hammer Wt./Fall:**	59 kg/750 mm
Date Start/Finish:	8/12/08-8/12/08	**Drilling Method:**	Hollow Stem Auger	**Core Barrel:**	N/A
Boring Location:	3+280, 7.7 m Lt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed
Hammer Efficiency Factor:	0.633	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Walled Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 64 kg hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (kPa)
T_v = Pocket Torvane Shear Strength (kPa)
q_p = Unconfined Compressive Strength (Pa)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer effeciency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (kPa)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (m)	Sample No.	Pen/Rec (cm)	Sample Depth (m)	Blows (150 mm) Shear Strength (kPa) or RQD (%)	N-value	N_{60}	Casing Blows	Elevation (m)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0	1D	61.0/40.6	0.00 - 0.61	4/4/5/6	9	9	HSA	221.29		Dark brown, silty medium SAND, sod with roots. 0.30	
										Light brown, damp, loose, fine to medium SAND, little gravel.	
1											
	2D	61.0/45.7	1.52 - 2.13	7/9/10/9	19	20				Light brown, damp, medium dense, fine to medium SAND, little gravel, trace silt.	
2											
								218.86		2.74	
3	3D	61.0/45.7	3.05 - 3.66	9/7/7/10	14	15				Grey, moist, medium dense, fine SAND, trace silt.	
								217.85		3.75	
4										**Bottom of Exploration at 3.75 m below ground surface.** AUGER REFUSAL	
5											
6											
7											

Remarks:

Auto Hammer #283

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Maine Department of Transportation

Soil/Rock Exploration Log
METRIC UNITS

Project: Route 2
Location: Gilead, Maine

Boring No.: HB-GILE-104
PIN: 9184.60

Driller:	MaineDOT	**Elevation (m):**	221.50	**Auger ID/OD:**	125 mm
Operator:	E. Giguere/C. Giles	**Datum:**	NAVD 88	**Sampler:**	Standard Split Spoon
Logged By:	K. Breskin	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	59 kg/750 mm
Date Start/Finish:	8/12/08-8/12/08	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	0+047, 3.0 Rt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed
Hammer Efficiency Factor:	0.77	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Walled Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 64 kg hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (kPa)
T_v = Pocket Torvane Shear Strength (kPa)
q_p = Unconfined Compressive Strength (Pa)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer effeciency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (kPa)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (m)	Sample No.	Pen/Rec (cm)	Sample Depth (m)	Blows (150 mm) Shear Strength (kPa) or RQD (%)	N-value	N_{60}	Casing Blows	Elevation (m)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0	PC-1						SSA	221.41		HMA, core taken.	
										0.09	
	1D									Off auger.	G#208695 A-1-b, SW-SM WC=3.2%
1	2D	61.0/61.0	0.91 - 1.52	3/4/7/13	11	14				Brown, moist, medium dense, sandy GRAVEL, trace fines.	G#208696 A-1-b, SW-SM WC=5.4%
				5/35				219.83		1.68	
2										**Bottom of Exploration at 1.68 m below ground surface.** REFUSAL	
3											
4											
5											
6											
7											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Boring No.: HB-GILE-104

Maine Department of Transportation

Soil/Rock Exploration Log
METRIC UNITS

Project: Route 2
Location: Gilead, Maine

Boring No.: HB-GILE-105
PIN: 9184.60

Driller:	MaineDOT	**Elevation (m):**	218.60	**Auger ID/OD:**	125 mm
Operator:	E. Giguere/C. Giles	**Datum:**	NAVD 88	**Sampler:**	Standard Split Spoon
Logged By:	K. Breskin	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	59 kg/750 mm
Date Start/Finish:	8/12/08-8/12/08	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	3+940, 2.0 m Rt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed
Hammer Efficiency Factor:	0.77	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Walled Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 64 kg hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (kPa)
T_v = Pocket Torvane Shear Strength (kPa)
q_p = Unconfined Compressive Strength (Pa)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer effeciency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (kPa)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (m)	Sample No.	Pen/Rec (cm)	Sample Depth (m)	Blows (150 mm) Shear Strength (kPa) or RQD (%)	N-value	N_{60}	Casing Blows	Elevation (m)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0							SSA	218.48		75 mm core on macadam.	
										0.12	
	1D	61.0/38.1	0.30 - 0.91	6/12/9/8	21	27				Red brown, moist, medium dense, fine to medium SAND, trace silt.	G#208697 A-2-4, SM WC=13.5%
1								217.69		0.91	
	2D	61.0/40.6	1.52 - 2.13	8/16/33/29	49	63				Silty, medium dense, fine SAND.	G#208698 A-1-b, SW-SM WC=3.1%
								216.77		1.83	
2										Brown, moist, dense, stony GRAVEL, trace silt.	
								216.47		2.13	
										Bottom of Exploration at 2.13 m below ground surface. NO REFUSAL	
3											
4											
5											
6											
7											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Maine Department of Transportation

Soil/Rock Exploration Log
METRIC UNITS

Project: Route 2
Location: Gilead, Maine

Boring No.: HB-GILE-106
PIN: 9184.60

Driller:	MaineDOT	**Elevation (m):**	217.10	**Auger ID/OD:**	125 mm
Operator:	E. Giguere/C. Giles	**Datum:**	NAVD 88	**Sampler:**	Standard Split Spoon
Logged By:	K. Breskin	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	59 kg/750 mm
Date Start/Finish:	8/12/08-8/12/08	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	4+580, 3.0 m Lt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed
Hammer Efficiency Factor:	0.77	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Walled Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 64 kg hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (kPa)
T_v = Pocket Torvane Shear Strength (kPa)
q_p = Unconfined Compressive Strength (Pa)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer effeciency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (kPa)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (m)	Sample No.	Pen/Rec (cm)	Sample Depth (m)	Blows (150 mm) Shear Strength (kPa) or RQD (%)	N-value	N_{60}	Casing Blows	Elevation (m)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0							SSA			Dark brown, damp, very loose, sandy GRAVEL, some silt.	
1	1D	61.0/27.9	0.91 - 1.52	2/2/2/2	4	5					G#208699 A-1-b, SW-SM WC=11.8%
				35/20							
2								215.27		1.83 **Bottom of Exploration at 1.83 m below ground surface.** ROCK REFUSAL	
3											
4											
5											
6											
7											

Remarks:

PC-2 taken at Sta. 4+500 in Lt. wheel path, 100 mm core taken.

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Maine Department of Transportation

Soil/Rock Exploration Log
METRIC UNITS

Project: Route 2
Location: Gilead, Maine

Boring No.: HB-GILE-111
PIN: 9184.60

Driller:	MaineDOT	**Elevation (m):**	216.30	**Auger ID/OD:**	125 mm
Operator:	E. Giguere/C. Giles	**Datum:**	NAVD 88	**Sampler:**	N/A
Logged By:	K. Breskin	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	8/12/08-8/12/08	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	4+780, 6.5 m Lt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed
Hammer Efficiency Factor:	0.77	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Walled Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 64 kg hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (kPa)
T_v = Pocket Torvane Shear Strength (kPa)
q_p = Unconfined Compressive Strength (Pa)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer effeciency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (kPa)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (m)	Sample Information: Sample No.	Pen/Rec (cm)	Sample Depth (m)	Blows (150 mm) Shear Strength (kPa) or RQD (%)	N-value	N_{60}	Casing Blows	Elevation (m)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0							SSA			Auger Probe	
								215.84		0.46	
										Bottom of Exploration at 0.46 m below ground surface. REFUSAL	
1											
2											
3											
4											
5											
6											
7											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Maine Department of Transportation

Soil/Rock Exploration Log
METRIC UNITS

Project: Route 2
Location: Gilead, Maine

Boring No.: HB-GILE-112
PIN: 9184.60

Driller:	MaineDOT	**Elevation (m):**	216.50	**Auger ID/OD:**	125 mm
Operator:	E. Giguere/C. Giles	**Datum:**	NAVD 88	**Sampler:**	N/A
Logged By:	K. Breskin	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	8/12/08-8/12/08	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	4+800, 4.0 m Lt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed
Hammer Efficiency Factor:	0.77	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Walled Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 64 kg hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (kPa)
T_v = Pocket Torvane Shear Strength (kPa)
q_p = Unconfined Compressive Strength (Pa)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer effeciency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (kPa)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (m)	Sample Information: Sample No.	Pen/Rec (cm)	Sample Depth (m)	Blows (150 mm) Shear Strength (kPa) or RQD (%)	N-value	N_{60}	Casing Blows	Elevation (m)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0							SSA			Auger Probe	
								215.92		0.58	
										Bottom of Exploration at 0.58 m below ground surface. REFUSAL	
1											
2											
3											
4											
5											
6											
7											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

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Maine Department of Transportation

Soil/Rock Exploration Log
METRIC UNITS

Project: Route 2
Location: Gilead, Maine

Boring No.: HB-GILE-114
PIN: 9184.60

Driller:	MaineDOT	**Elevation (m):**	230.70	**Auger ID/OD:**	125 mm
Operator:	E. Giguere/C. Giles	**Datum:**	NAVD 88	**Sampler:**	Standard Split Spoon
Logged By:	K. Breskin	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	59 kg/750 mm
Date Start/Finish:	8/12/08-8/12/08	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	5+340, 3.6 m Rt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed
Hammer Efficiency Factor:	0.77	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Walled Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 64 kg hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (kPa)
T_v = Pocket Torvane Shear Strength (kPa)
q_p = Unconfined Compressive Strength (Pa)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer effeciency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (kPa)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Sample Information

Depth (m)	Sample No.	Pen/Rec (cm)	Sample Depth (m)	Blows (150 mm) Shear Strength (kPa) or RQD (%)	N-value	N_{60}	Casing Blows	Elevation (m)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0							SSA	230.65		HMA, core taken.	
								230.58		0.05	
										Macadam.	
										0.12	
										Brown, moist, very dense, sandy GRAVEL, some silt.	
1											
	1D	61.0/48.3	1.52 - 2.13	26/21/31/48	52	67					
2								228.57		2.13	
										Same as above, but withj cobbles, sand and boulders.	
										Cobble from 2.49-2.96 m bgs.	
3								227.65		3.05	
	2D	61.0/40.6	3.05 - 3.66	27/35/25/33	60	77				Brown-grey brown, moist, very dense, SAND with cobbles.	G#208700 A-2-4, SM WC=8.2%
										Cobble from 3.62-3.84 m bgs.	
4								226.65		4.05	
								226.52		AUGER REFUSAL	
										4.18	
										Bottom of Exploration at 4.18 m below ground surface.	
5											
6											
7											

Remarks:

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Maine Department of Transportation

Soil/Rock Exploration Log
METRIC UNITS

Project: Route 2
Location: Gilead, Maine

Boring No.: HB-GILE-601
PIN: 9184.60

Driller:	Northern Test Boring, Inc.	**Elevation (m):**	218.69	**Auger ID/OD:**	125 mm
Operator:	Nick	**Datum:**	NAVD 88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	Diedrich D50 Trailer	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	2/26/09; 08:30-09:00	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	5+619.7, 2.7 Lt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed
Hammer Efficiency Factor:	0.84	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Walled Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 64 kg hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (kPa)
T_v = Pocket Torvane Shear Strength (kPa)
q_p = Unconfined Compressive Strength (Pa)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer effeciency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (kPa)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (m)	Sample No.	Pen/Rec (cm)	Sample Depth (m)	Blows (150 mm) Shear Strength (kPa) or RQD (%)	N-value	N_{60}	Casing Blows	Elevation (m)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0							SSA	218.57		PAVEMENT.	
										0.12	
										Brown, damp, fine to coarse SAND, some gravel.	
1											
								217.02		1.68	
2										Boulder or Ledge at 1.68 m bgs. Augered into to 3.2 m bgs.	
3								215.49		3.20	
										Bottom of Exploration at 3.20 m below ground surface. Moved to new location.	
4											
5											
6											
7											

Remarks:

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Maine Department of Transportation

Soil/Rock Exploration Log
METRIC UNITS

Project: Route 2
Location: Gilead, Maine

Boring No.: HB-GILE-602
PIN: 9184.60

Driller:	Northern Test Boring, Inc.	**Elevation (m):**	219.20	**Auger ID/OD:**	56.25/168.75 mm
Operator:	Nick	**Datum:**	NAVD 88	**Sampler:**	Standard Split Spoon
Logged By:	B. Wilder	**Rig Type:**	Diedrich D50 Trailer	**Hammer Wt./Fall:**	59 kg/750 mm
Date Start/Finish:	2/26/09; 09:30-13:30	**Drilling Method:**	Hollow Stem Auger	**Core Barrel:**	N/A
Boring Location:	5+562.2, 2.7 Lt.	**Casing ID/OD:**	N/A	**Water Level*:**	5.79 m bgs.
Hammer Efficiency Factor:	0.68	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Walled Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 64 kg hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (kPa)
T_v = Pocket Torvane Shear Strength (kPa)
q_p = Unconfined Compressive Strength (Pa)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer effeciency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (kPa)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (m)	Sample No.	Pen/Rec (cm)	Sample Depth (m)	Blows (150 mm) Shear Strength (kPa) or RQD (%)	N-value	N_{60}	Casing Blows	Elevation (m)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0							HSA	219.08		PAVEMENT. 0.12	
1											
2	1D	61.0/55.9	1.52 - 2.13	13/9/4/4	13	15				Brown, damp, very dense, fine to coarse SAND, some gravel, little silt.	G#212250 A-2-4, SM WC=16.0%
3								216.46		2.74	
	2D	61.0/50.8	3.05 - 3.66	10/12/12/14	24	27				Brown, moist, medium dense, fine to medium SAND.	G#175826 A-2-4, SP-SM WC=10.0%
4								215.24		3.96	
5	3D	61.0/55.9	4.57 - 5.18	38/39/41/60	80	91				Brown, wet, very dense, gravelly, fine to coarse SAND.	G#175827 A-1-b, SM WC=10.6%
6								213.41		5.79	
	4D	30.5/15.2	6.10 - 6.40	19/50	---					Brown, wet, very dense, fine to coarse SAND, some gravel, little silt, (Till).	G#175828 A-2-4, SM WC=11.1%
7											
	MD	0.0/0.0	7.19 - 7.19	50(0 mm)	---			212.01		7.19	
										Bottom of Exploration at 7.19 m below ground surface. SPOON AUGER REFUSAL	

Remarks:

Auto Hammer #149

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State of Maine - Department of Transportation

Power Auger Probe Summary Sheet

Town(s): Gilead Project Number: 9184.60

Station (Meter)	Offset (Meter)	Weathered Rock (Meter)	Refusal (Meter)	No Refusal (Meter)	Water Depth (m)	Comments Date: 8/12-13/08
3+240	CL			4.57		HB-GILE-102
3+320	CL			4.57		HB-GILE-103
4+820	14.0 Rt.		1.22			HB-GILE-113
5+720	18.2 Rt.		1.10			HB-GILE-115
5+740	16.4 Rt.		1.52			HB-GILE-116
5+760	14.5 Rt.		1.16			HB-GILE-117
5+780	19.0 Rt.		1.49			HB-GILE-118
5+800	18.0 Rt.		1.49			HB-GILE-119
5+820	15.0 Rt.		1.40			HB-GILE-120
5+840	11.0 Rt.		1.04			HB-GILE-121
5+860	11.0 Rt.		2.13			HB-GILE-122
6+060	10.6 Rt.		1.16			HB-GILE-123

Northern Test Boring
Logged By: B. Wilder

5" Solid Stem Auger

Appendix D
Lab Test Data
Lab Testing Summary Sheet
Grain Size Curves

State of Maine - Department of Transportation

Laboratory Testing Summary Sheet

Town(s): Gilead — Project Number: 9184.60

Boring & Sample Identification Number	Station (Meter)	Offset (Meter)	Depth (Meter)	Reference Number	G.S.D.C. Sheet	W.C.	L.L.	P.I.	Classification		
									Unified	AASHTO	Frost
HB-GILE-104, 1D	0+047	3.0 Rt.	Off Auger	208695	1	3.2			SW-SM	A-1-b	0
HB-GILE-104, 2D	0+047	3.0 Rt.	0.91-1.52	208696	1	5.4			SW-SM	A-1-b	0
HB-GILE-105, 1D	3+940	2.0 Rt.	0.30-0.91	208697	1	13.5			SM	A-2-4	II
HB-GILE-105, 2D	3+940	2.0 Rt.	1.52-2.13	208698	1	3.1			SW-SM	A-1-b	0
HB-GILE-106, 1D	4+580	3.0 Lt.	0.91-1.52	208699	1	11.8			SW-SM	A-1-b	0
HB-GILE-114, 2D	5+340	3.6 Rt.	3.05-3.66	208700	1	8.2			SM	A-2-4	II
HB-GILE-602, 1D	5+562.2	2.7 Lt.	1.52-2.13	212250	2	16.0			SM	A-2-4	II
HB-GILE-602, 2D	5+562.2	2.7 Lt.	3.05-3.66	175826	2	10.0			SP-SM	A-2-4	0
HB-GILE-602, 3D	5+562.2	2.7 Lt.	4.57-5.18	175827	2	10.6			SM	A-1-b	II
HB-GILE-602, 4D	5+562.2	2.7 Lt.	6.1-6.4	175828	2	11.1			SM	A-2-4	II

Classification of these soil samples is in accordance with AASHTO Classification System M-145-40. This classification is followed by the "Frost Susceptibility Rating" from zero (non-frost susceptible) to Class IV (highly frost susceptible). The "Frost Susceptibility Rating" is based upon the MDOT and Corps of Engineers Classification Systems.

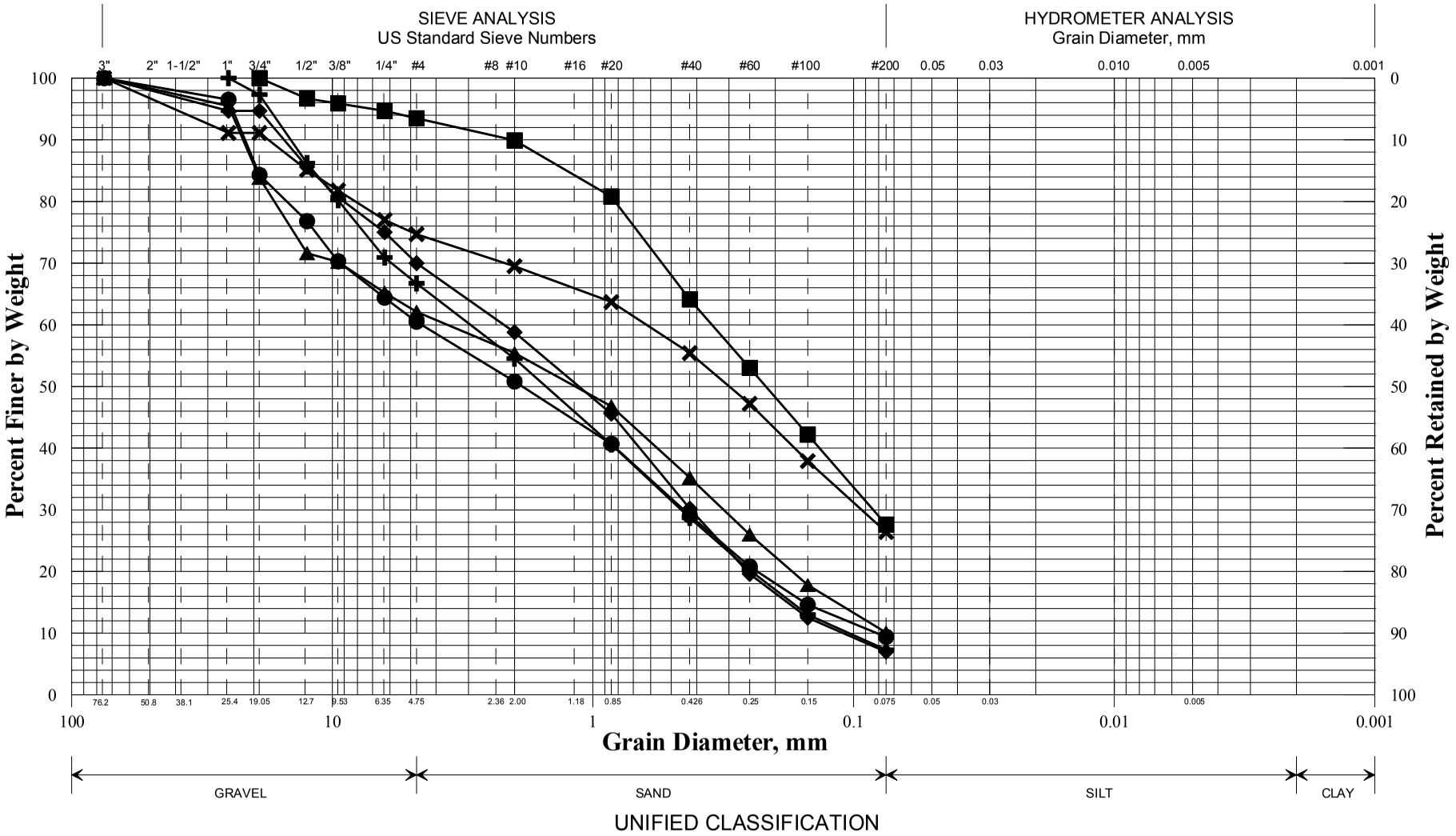
GSDC = Grain Size Distribution Curve as determined by AASHTO T 88-93 (1996) and/or ASTM D 422-63 (Reapproved 1998)

WC = water content as determined by AASHTO T 265-93 and/or ASTM D 2216-98

LL = Liquid limit as determined by AASHTO T 89-96 and/or ASTM D 4318-98

PI = Plasticity Index as determined by AASHTO 90-96 and/or ASTM D4318-98

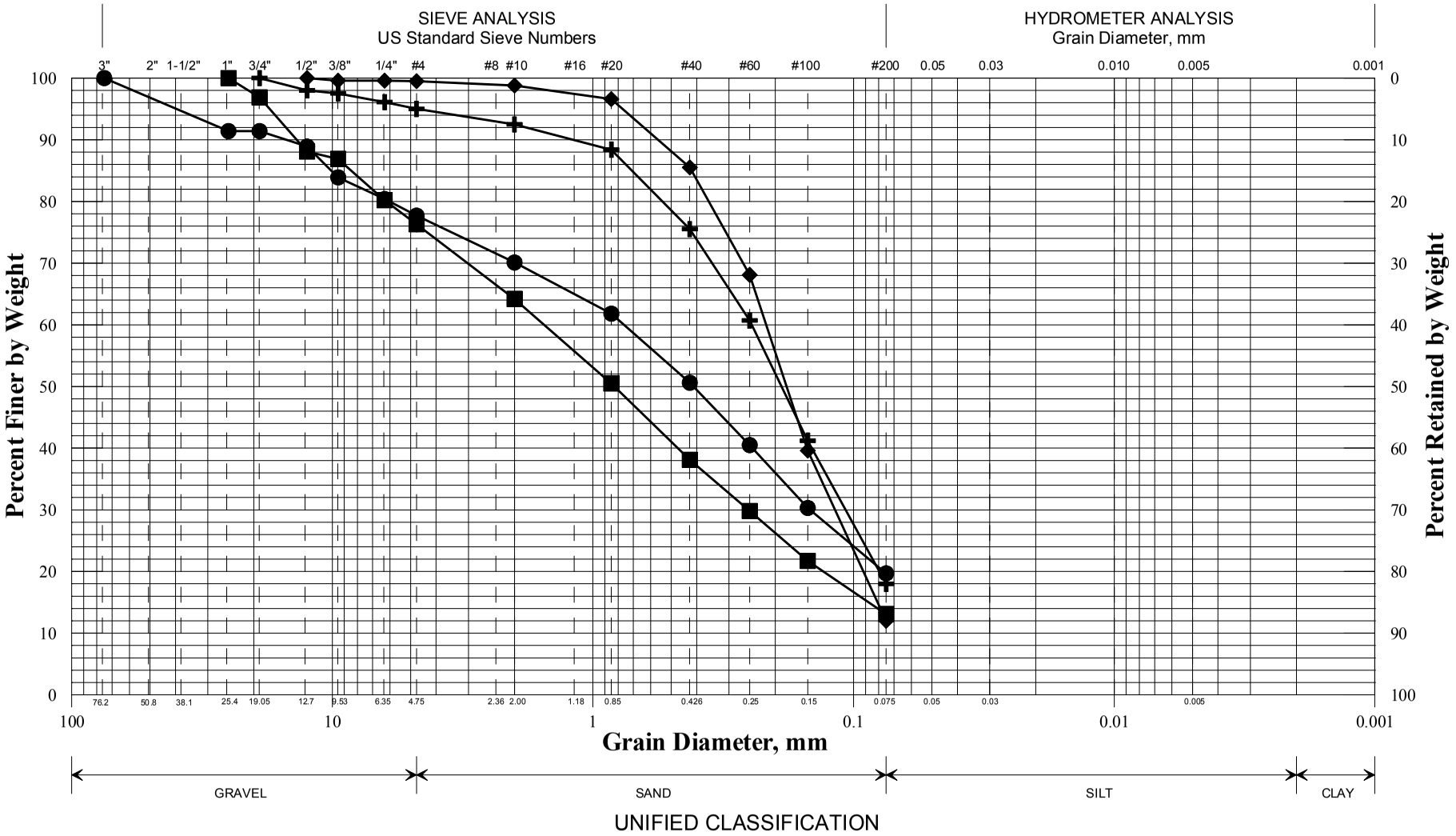
State of Maine Department of Transportation
GRAIN SIZE DISTRIBUTION CURVE



	Boring/Sample No.	Station	Offset, m	Depth, m	Description	W, %	LL	PL	PI
✚	HB-GILE-104/1D	0+047	3.0 RT	OFF AUGER	SAND, some gravel, trace silt.	3.2			
◆	HB-GILE-104/2D	0+047	3.0 RT	0.91-1.52	SAND, some gravel, trace silt.	5.4			
■	HB-GILE-105/1D	3+940	2.0 RT	0.30-0.91	SAND, some silt, trace gravel.	13.5			
●	HB-GILE-105/2D	3+940	2.0 RT	1.52-2.13	Gravelly SAND, trace silt.	3.1			
▲	HB-GILE-106/1D	4+580	3.0 LT	0.91-1.52	Gravelly SAND, trace silt.	11.8			
✕	HB-GILE-114/2D	5+340	3.6 RT	3.05-3.66	SAND, some silt, some gravel.	8.2			

PIN
009184.60
Town
Gilead
Reported by/Date
WHITE, TERRY A 10/21/2008

State of Maine Department of Transportation
GRAIN SIZE DISTRIBUTION CURVE



	Boring/Sample No.	Station	Offset, m	Depth, m	Description	W, %	LL	PL	PI
✚	HB-GILE-602/1D	5+562.2	2.7 LT	1.52-2.13	SAND, little silt, trace gravel.	16.0			
◆	HB-GILE-602/2D	5+562.2	2.7 LT	3.05-3.66	SAND, little silt, trace gravel.	10.0			
■	HB-GILE-602/3D	5+562.2	2.7 LT	4.57-5.18	SAND, some gravel, little silt.	10.6			
●	HB-GILE-602/4D	5+562.2	2.7 LT	6.1-6.4	SAND, some gravel, little silt.	11.1			
▲									
✕									

PIN
009184.60
Town
Gilead
Reported by/Date
WHITE, TERRY A 3/18/2009

Appendix E
Reinforced Soil Slope
Discussion
Computer Models

Reinforced Soil Slope

Existing Conditions The existing hillside is extremely steep and appears to be marginally stable. Underlying soils are moist, very dense (N_{60} = 15 to 91) Sands with 12% to 20% fines. Groundwater was encountered 5.8 meters below the roadway surface and there is a pond with no outlet at the toe of slope. The lower slope is at an angle of 1.11h:1v with scattered vegetation. The trees are gunstocked but there are no obvious significant scarps. It hasn't failed yet, but it isn't stable. I modeled the slope in Geoslope with a value of ϕ=38^o for the native soils – 90% of arctan 1:1.11 – and got a Factor of Safety (FS) of 1.14. This is a believable value for the conditions at this slope. The FS was much higher with a shallow failure surface exiting through the upper slope where construction will take place, but FS=1.33 for the upper slope is still below Federal minimum standards for highway slopes.

It will not be feasible to raise the FS to 1.5 in this location without complete reconstruction of the slope from the toe up, and a 1v:1.5h slope would extend into the pond. Any construction in the pond would raise the height of water against the railroad embankment, which was built with no outlet. Approval by the railroad was not considered likely.

Proposed Construction The Reinforced Soil Slope (RSS) was designed to intercept the failure surfaces that exit through the lower slope, in an effort to improve the FS of the entire slope area rather than just the area of construction. The following values were used:

Soil unit	ϕ	γ
Native till	38	20.5 kN/m^3
Reinforced Fill	32	19.0 kN/m^3
Gravel	35	18.5 kN/m^3
Geocells	45	18.5 kN/m^3

A low value was used for the reinforced fill to allow use of any excavated material that meets the particle size requirements for this application. FHWA Demo 82 recommends that "backfill is limited to low-plasticity, granular materi (i.e., PI<=20 and <=50 percent finer that 0.075 mm)", but that with good drainage and careful construction control, most indigenous soil can be used. A maximum particle size of 150 mm is specified, and particles larger than 75 mm should be kept well away from the face of the slope.

The Geoslope model was run using the above values to determine the strength and placement of reinforcement geotextile needed for this slope. Geotexile layers in the model were placed horizontal in section to intercept the most critical failure paths. A minimum length of 7 meters will be needed 10 meters below the roadway surface.

Reinforcement geotextiles one meter apart provide adequate strength in this application. The lengths of other layers were adjusted in the model to allow the maximum length possible with a reasonable amount of excavation on the right side of the roadway to maintain traffic during construction. The geotextile lengths increase from bottom to top following a 1v:1.5h slope from the lowest layer to the roadway.

Two different strengths are needed for reinforcement geotextiles: The upper five layers of geotextile should have a long-term allowable strength (LTDS) of not less than 44 kN,

where LTDS=T_a/reduction factors. For the lower layers, a minimum LTDS of 33 KN will be adequate. Compaction aid geotextiles with a minimum strength of 2 kN will be required every 330 mm. Compaction aid geotextiles will be 2 meters long.

The FS produced by Geoslope for this application is 1.325 for upper slope failures and 1.217 for lower slope failures. Additional strength in the geotextile layers did not significantly increase the FS of the slope. It is not possible to substantially raise the FS of this slope without reconstruction of the toe of slope. Reconstruction of the toe of slope is beyond the scope of this project. These values are comparable to or better than the existing conditions.

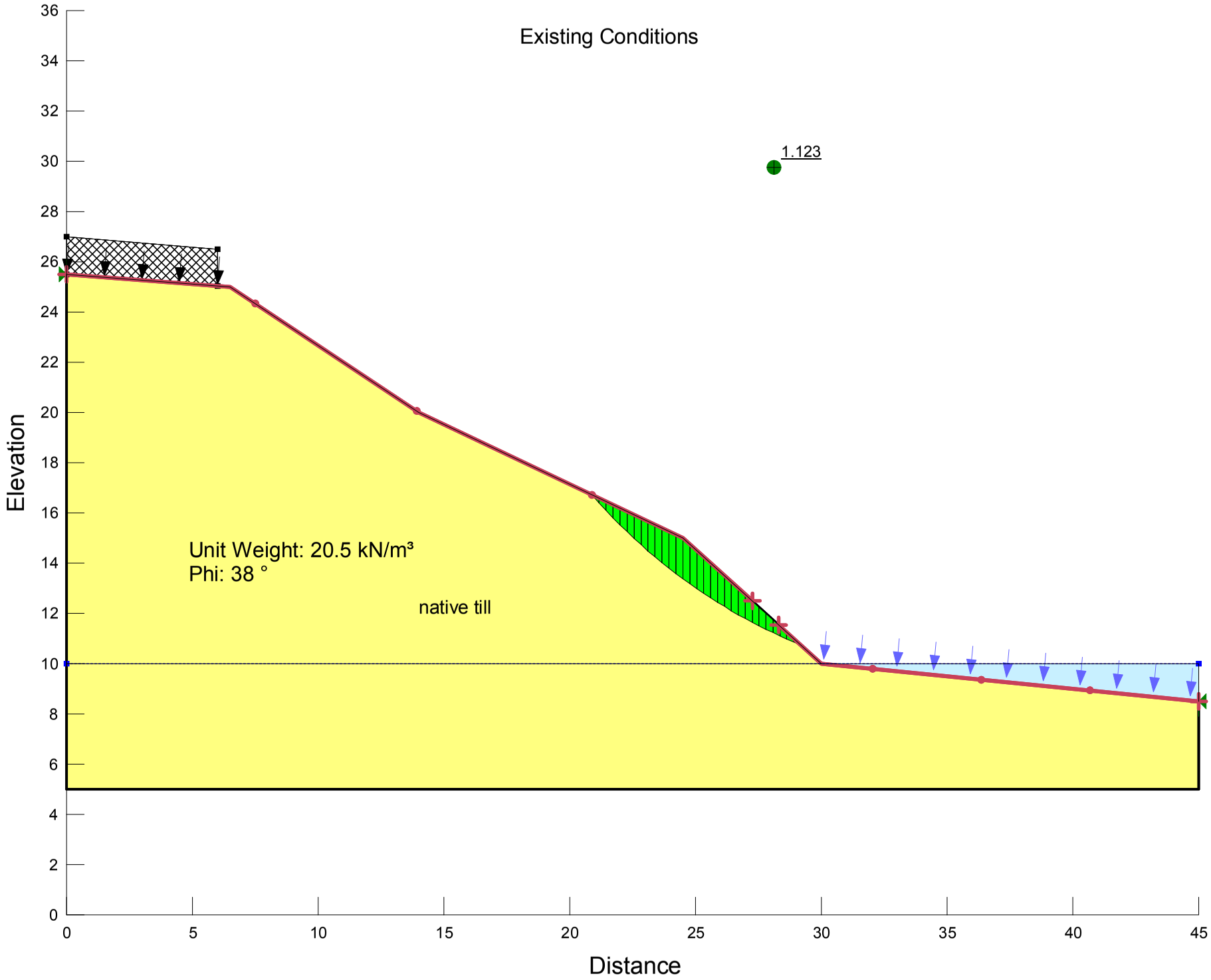
Surface water sinks into the ground in the slope above the road, and exits through the lower slope in seeps. A riprap chimney drain should be used at the back of the RSS to allow this drainage.

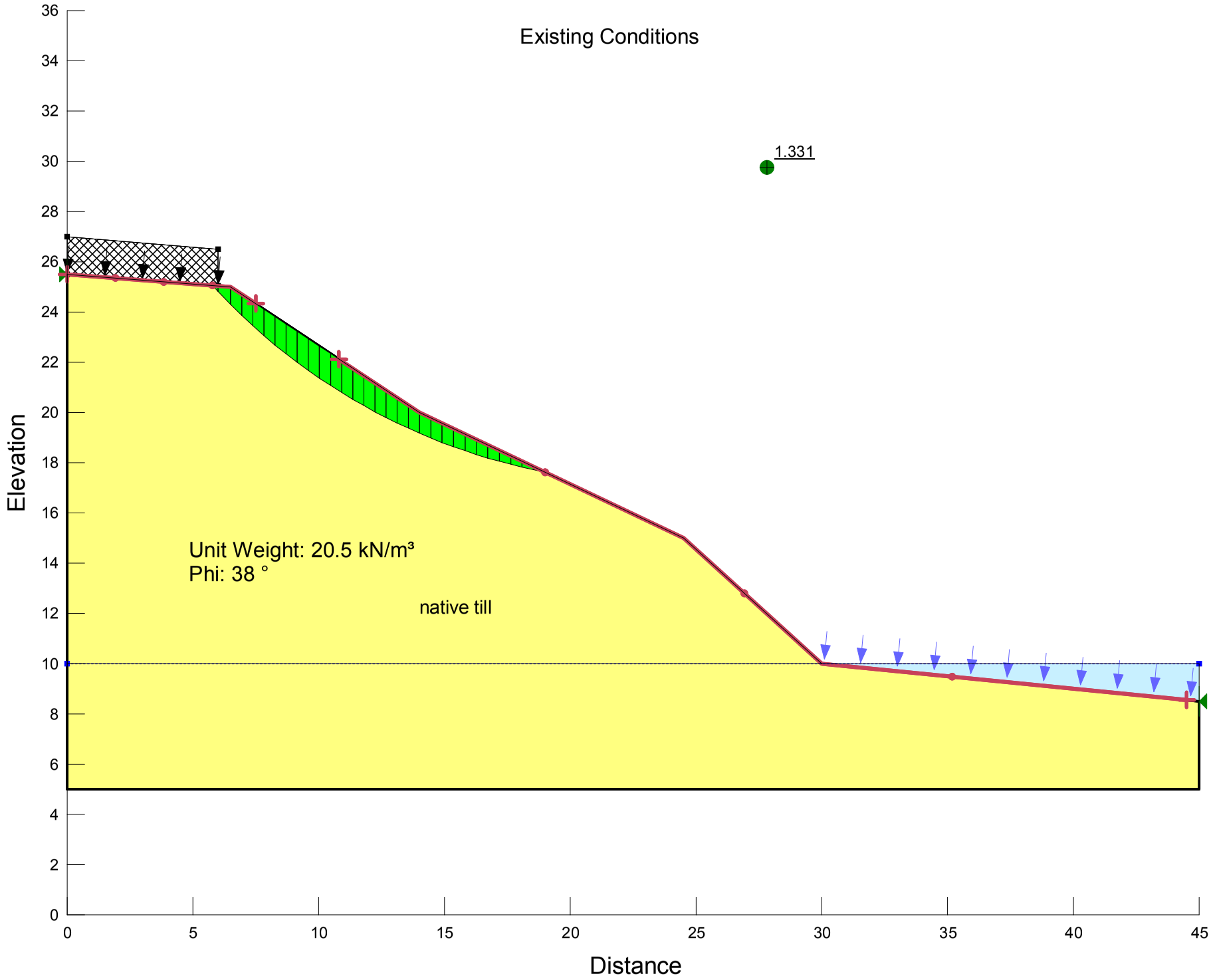
The RSS will not have a wrapped face to minimize problems of sliding between the facing and the reinforced soil, so extreme care will be needed during construction to avoid loss of material at the face of the slope.

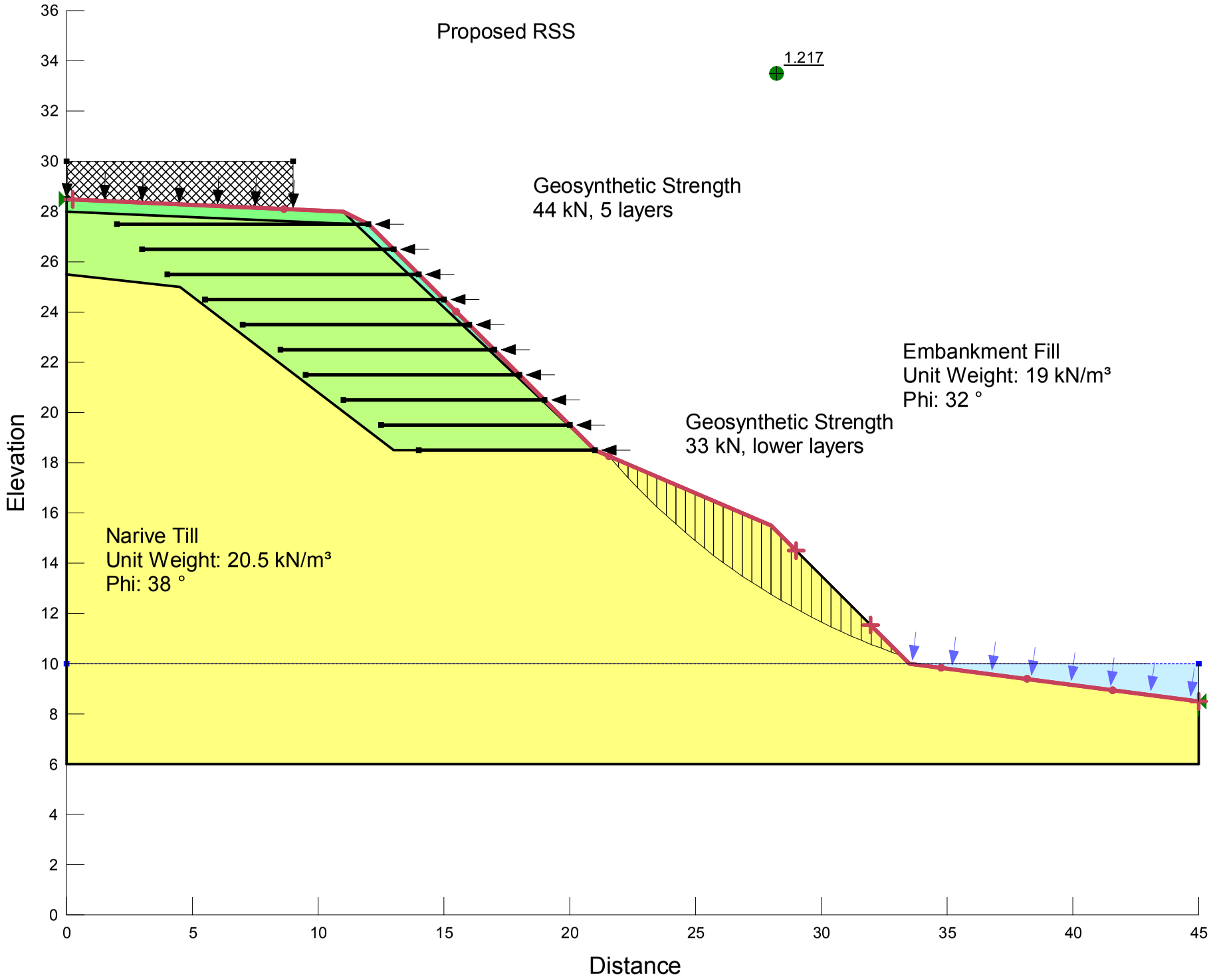
This slope is on the north side of a hill in the area of the White Mountains. It will get direct sunlight for a very short part of the day, for a very short part of the year. A robust facing system will be needed to minimize problems of erosion on the face of slope. Geocells will be pinned into the face of the slope, with loam infill. The Landscape Architect for the project has designed a system of Turf Reinforcement Mat, a special Seeding Mix, and a Hydromulch Growth Medium.

The attached Geoslope model outputs show the following:

1. Existing conditions: failure in lower slope
2. Existing conditions: failure in upper slope
3. Reinforced soil slope: failure in lower slope
4. Reinforced soil slope: failure in upper slope


Existing Conditions
1.123
Unit Weight: 20.5 kN/m³
Phi: 38 °
native till
Elevation
Distance
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
0
5
10
15
20
25
30
35
40
45


Existing Conditions
1.331
Unit Weight: 20.5 kN/m³
Phi: 38 °
native till
Elevation
Distance
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
0
5
10
15
20
25
30
35
40
45


Proposed RSS
1.217
Geosynthetic Strength
44 kN, 5 layers
Embankment Fill
Unit Weight: 19 kN/m³
Phi: 32 °
Geosynthetic Strength
33 kN, lower layers
Narive Till
Unit Weight: 20.5 kN/m³
Phi: 38 °
Elevation
Distance
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
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5
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15
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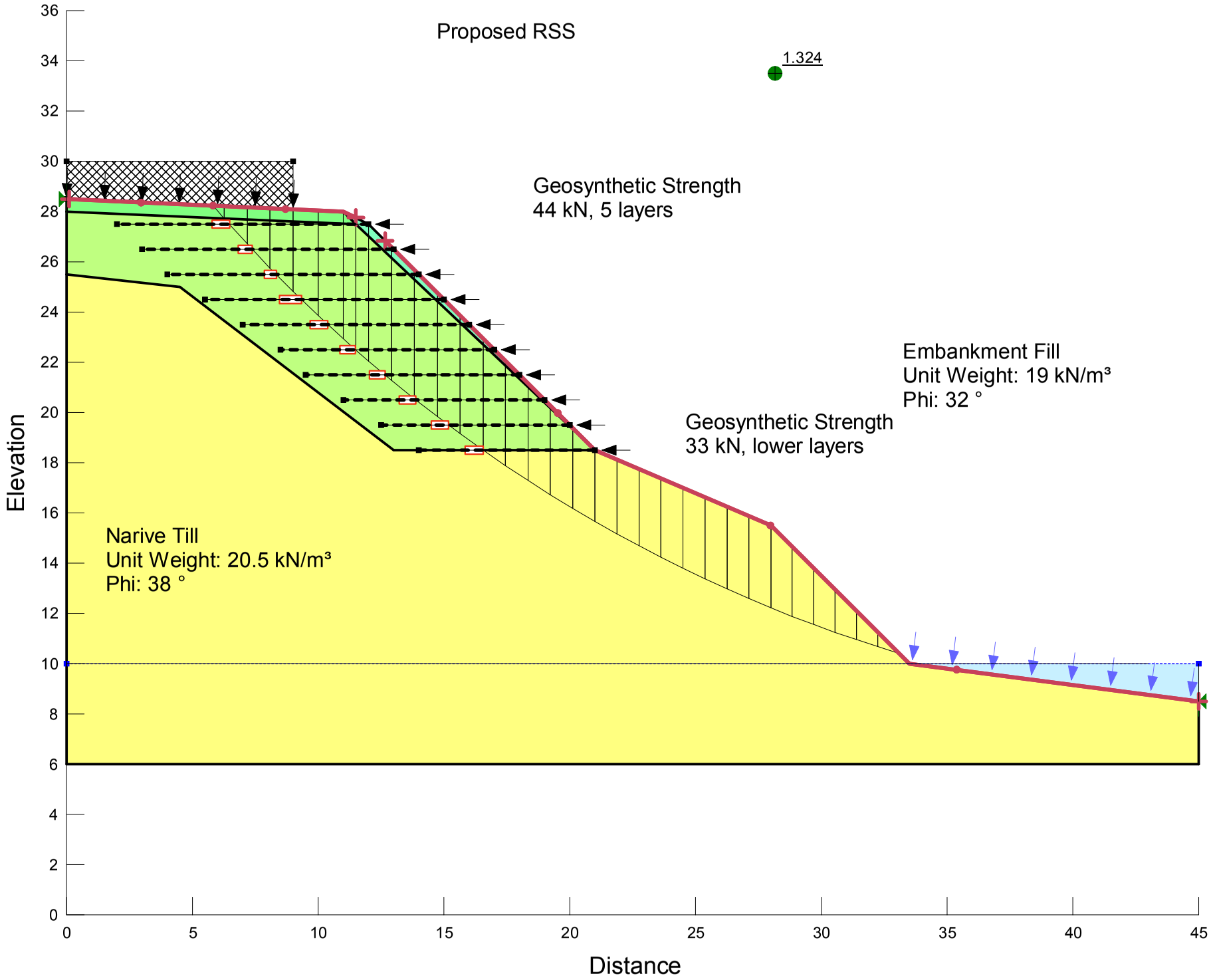
45


Proposed RSS
1.324
Geosynthetic Strength
44 kN, 5 layers
Embankment Fill
Unit Weight: 19 kN/m³
Phi: 32 °
Geosynthetic Strength
33 kN, lower layers
Narive Till
Unit Weight: 20.5 kN/m³
Phi: 38 °
Elevation
Distance
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
0
5
10
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20
25
30
35
40
45